Steel-Tile

The General Fireproofing Company

Youngstown, Ohio

GF Steel-Tile

AN ECONOMICAL SYSTEM
OF FLOOR CONSTRUCTION

A statement of the many accepted advantages of GF Steel-Tile Floor Construction; with a collection of tables for designing and building Steel-Tile Floors, and a complete specification for the work from start to finish

The General Fireproofing Co.
Youngstown, Ohio

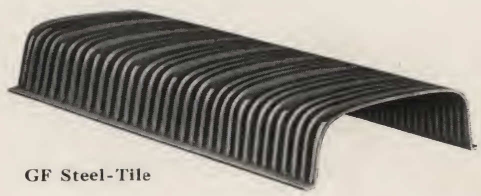
New York - Chicago - Boston - Philadelphia - Utica
Buffalo - Kansas City - Omaha - Minneapolis - San Francisco

Contents

GF STEEL-TILE

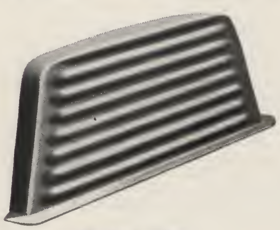
GF STEEL-TILE are light steel forms of various depths used with reinforced concrete in floor construction. Their purpose is to form a series of regularly spaced joist or T-beams uniform in size and spacing, and in which is combined the essential amount of reinforcement and concrete to support the desired loading.

GF Steel-Tile floors are monolithic throughout their area. All useless concrete is eliminated, reducing the dead weight and increasing the live load capacity.



GF Steel-Tile

Every feature of GF Steel-Tile floor construction speaks economy. The open form work used saves material and labor and may be re-used many times. The reduced dead load and concentration of all reinforcement in the deep joists makes possible the elimination of small bars carrying large "extras." Bending and placing is simplified and rapid erection is facilitated.



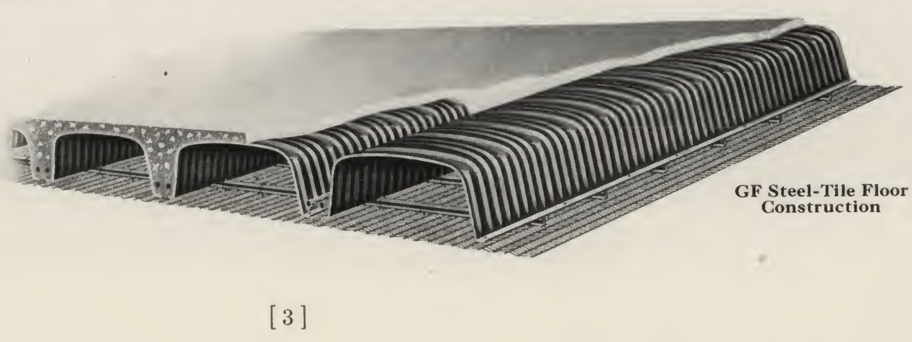
GF End-Tile

GF Steel-Tile are made from No. 26 gauge Steel with deep stiffening corrugation across the top and in the sloping side. Each supporting edge is finished with a flat flange that fits down tightly over the forms or ceiling lath preventing all loss of concrete at this point during the pouring process.

GF Steel-Tile are made in depths of 4, 6, 8, 10, 12 and 14″ and in lengths of 30 and 35″. Tapered tile are made in 10, 12 and 14″ depths and are 35″ in length and are made for use in extreme conditions where extra shearing strength is necessary at beam intersections. Their use eliminates the necessity for stirrups.

All regular tile are 20″ across the bottom. Tapered sections are 20″ wide at one end and tapered to 15″ at the other, increasing the width of the joist from 5″ to 10″ at the intersection with the beam. End Caps are provided for all sizes including tapered tile.

All GF Steel-Tile are shipped nested in compact bundles. They are easily handled in transit and on the building, require no large storage areas and entail no loss whatever through breakage.



GF Steel-Tile Floor Construction

Ellison Motor Supply Co. Garage, Haverhill, Mass.
Contractor, J. H. Hanson,
Kingston, N. H.

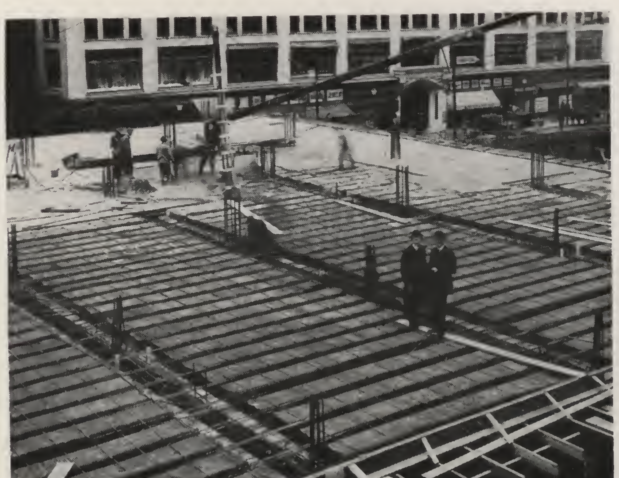
Hanson Bros. Theatre, Minneapolis, Minn.
Architect, O. K. Westphal & Co., Minneapolis, Minn.
Contractor, N. F. Larson

Ceilings beneath GF Steel-Tile floors are formed by placing Herringbone Rigid Metal Lath directly on the supporting form work after which the Tile are placed in position, then the reinforcing steel and finally the concrete. Suspended ceilings are readily formed by building anchors into the joists between the Tile before the concrete is poured.

GF Steel-Tile Floors Light in Weight

GF Steel-Tile floors occupy from 45 to 60% of the cubical contents of the floor. This area eliminates useless concrete and changes the type of floor construction by concentrating the essential area of concrete with its reinforcement in such a position that its maximum strength value is secured. This is done without sacrificing anything in the strength of the floor and with a material decrease in the weight of the slab and amount of concrete required.

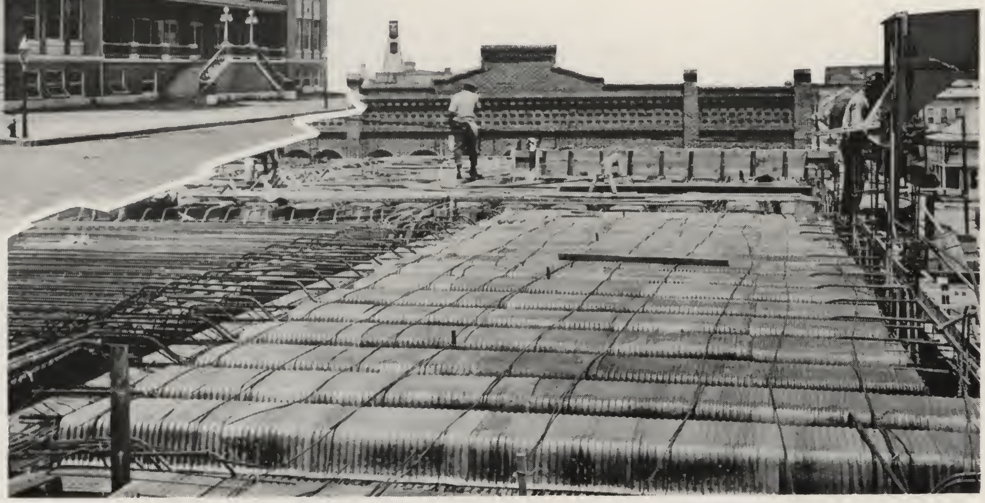
This reduction permits lighter girders, beams, columns and footings.



Plankington Arcade Building, Milwaukee, Wis.
Architect, Holabird & Roche, Chicago, Ill.
General Contractor, J. B. Parker & Co., New York City

Commercial Building, Bay City, Mich.
Architect, A. E. Munger
Contractor, H. C. Weber Construction Co.

Italian Club, Tampa, Florida



Architect, Baufey & Elliott
Contractor, Bates, Hudnall-Jetton Co.

Strength of GF Steel-Tile Floors

THE reduction in weight does not in the least imply a sacrifice in strength. Every particle of concrete in GF Steel-Tile floor slab is utilized and is so distributed that its whole strength can be exerted to sustain live loads placed thereon. The reinforcement therein is reduced in area only as a result of the elimination of useless dead weight.

From accurate tables on pages 15 to 21 inclusive, the necessary floor thickness, weights of construction, and amount of reinforcing steel for any given loading or span, may be obtained.

La Salle & Koch Co. Building, Toledo, Ohio
Architect, Starrett & Van Vleck, New York City
Contractor, A. Bentley & Sons Co., Toledo, Ohio

Monastery of the Visitation, Toledo, Ohio
Joseph C. Huber, Architect, Toledo, Ohio
General Contractor, Julius Comte

Economy of GF Steel-Tile Floors

OPEN form work costing about one-half as much as ordinary form work is all that is necessary for GF Steel-Tile construction. This means a saving in lumber, speedy erection and the frequent re-use of material therein. A 2″ x 6″ or 2″ x 8″ plank spaced 25″ on center is all that is necessary. GF Steel-Tile occupying the intervening space are quickly placed in position by inexperienced men, and prevent, by their close contact with the supporting forms, all loss of concrete at this point or at overlapping ends of the tile themselves.

There is absolutely no breakage in GF Steel-Tile and the storage area required is reduced to a minimum. Large areas may be nested and handled quickly in and about the building.

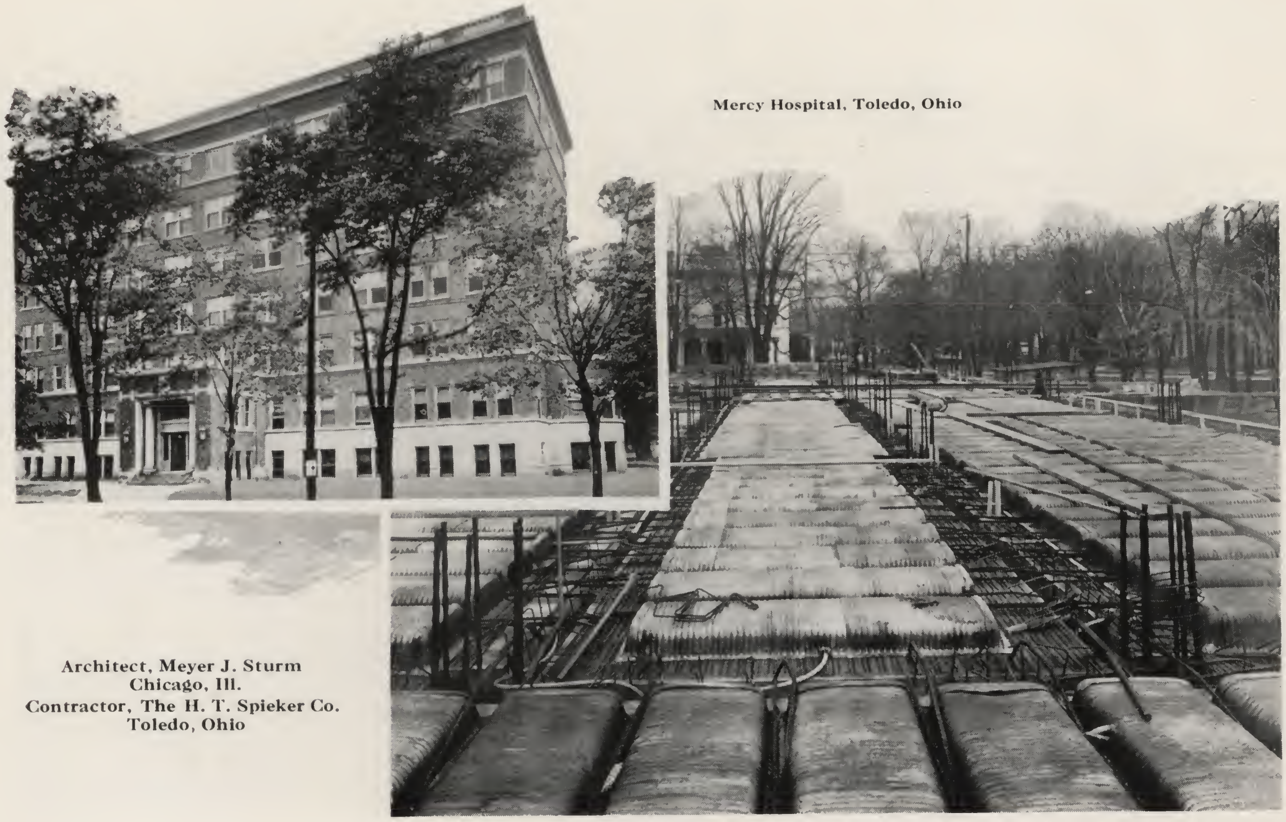
On page 11 a suggested type of form work or centering for Steel-Tile floors is shown. Note the simple skeleton construction with the openly spaced supporting joists requiring much less lumber than solid form work and much less time for erection.

GF Steel-Tile can be laid more rapidly than any other type of fireproof floor construction. After the erection of the form work Herringbone Lath is placed directly thereon after which the Steel-Tile are placed in position and lightly tacked to the supporting forms. Spacers are frequently used to maintain a uniform width of joist and to support the reinforcing bars. These are to be recommended but are not essential to the success of a GF Steel-Tile floor.

End Tile are used to close each end of each row of Tile.

All sizes of GF Steel-Floor-Tile are ordinarily furnished immediately from stock with End Tile to match.

Mercy Hospital, Toledo, Ohio



Architect, Meyer J. Sturm
Chicago, Ill.
Contractor, The H. T. Spieker Co.
Toledo, Ohio

Sherman School, Toledo, Ohio

Architect, E. M. Gee, Toledo, Ohio
Contractor, The H. T. Spieker Co.
Toledo, Ohio

Children's Home, Miama, Ohio

Architect, Thos. F. Huber
Toledo, Ohio
Contractor, A. Bentley & Sons Co.
Toledo, Ohio

Uses of GF Steel-Tile

GF STEEL-TILE floors are particularly economical on long span, light load construction such as will ordinarily be found in schools, hospitals, office buildings, light factories and similar structures. The exclusive features of GF Steel-Tile floor construction as herein outlined warrant the consideration of Steel-Tile for almost every building operation.

Cost data, suggestions or sketches will be furnished to interested parties.

Ceiling Construction with GF Steel-Tile

GF STEEL-TILE floor slabs permit a flat ceiling for the reason that the lightened construction is capable of spanning large openings without intermediate beams. Two methods of ceiling construction are in common use.

The more practical method for all purposes is to place Herringbone Metal Lath directly over the supporting forms before the Steel-Tile are placed in position. Light wires are placed through the lath in the spaces between the tile and are wrapped around the reinforcing bars before the concrete is placed. The placing of the concrete insures a positive support for the ceiling construction.

Another method is to place wire hangers in the concrete joist to which the ceiling construction may be attached after the pouring of the concrete has been completed and the forms have been removed. This method permits the placing of the ceiling at any desired

height below the floor construction, and is used in all suspended ceiling construction or where it is desired to drop the ceiling to the level of the lowest beam that all supporting beams, when such are necessary, may be hidden from view.

A fully detailed specification for suspended ceiling construction will be found on page 13.

The type of Herringbone recommended for ceiling work, either directly under Steel-Tile or for suspended ceilings as recommended, is our AAA No. 24 Gauge Herringbone Metal Lath which has been designed especially for Steel-Tile and which will safely span the 25″ spacing without deflection. With channel furred ceilings, in suspended ceiling construction, ¾″ supporting channels are spaced 24″ on center. AAA Herringbone Metal Lath is exceptionally well suited to the types of ceiling described, because it is a Metal Lath possessing both the stiffness and bonding qualities so necessary for dependable ceiling construction. Its heavy longitudinal ribs run in a direct line from support to support and prevent all deflection, while the connecting cross strands are flattened just enough to permit the plaster to curl completely around the strands, forming a perfect key and thoroughly imbedding the lath in the plaster it supports.

Always specify "Herringbone" Rigid Metal Lath for all Steel-Tile floor construction and the resulting job throughout will be a source of complete satisfaction. Other uses of Herringbone are described at length in our Herringbone Handbook, which will be furnished on request.

Removing GF Steel-Tile

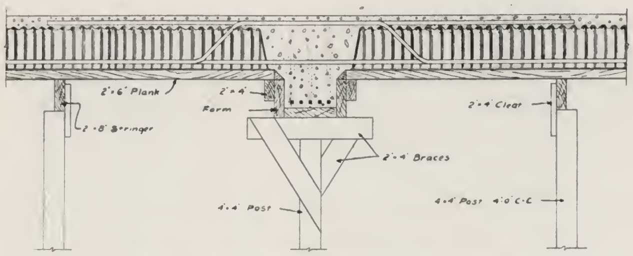
IN buildings such as garages, warehouses or light manufacturing establishments where ceilings are not desired, all of the economies of GF Steel-Tile construction may be obtained at a decided saving in cost by removing the tile for re-use in other locations.

GF Steel-Tile are sufficiently strong to withstand, with reasonable care, their re-use at least three times.

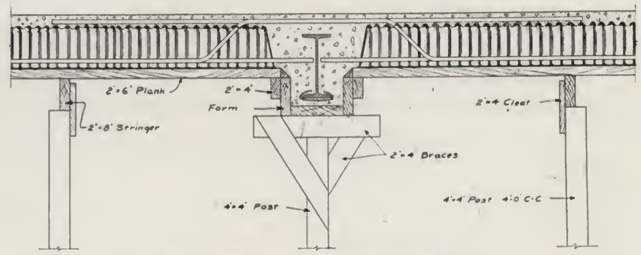
In such work the Tile should be carefully oiled to facilitate their removal readily, and supporting forms should be so constructed that the tile may be taken out one or two days after concrete has been poured without disturbing the supporting construction.

The regularity of GF Steel-Tile makes their removal a simple matter and the exposed concrete construction is pleasing in appearance.

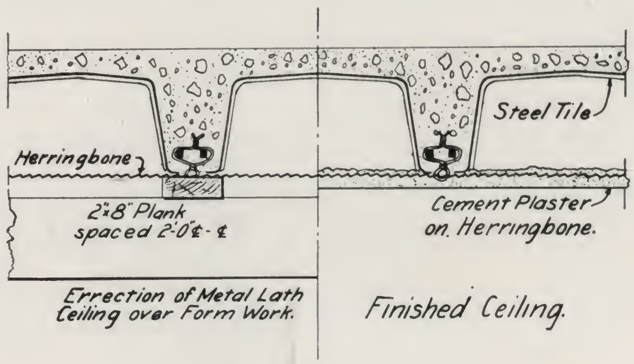
Details

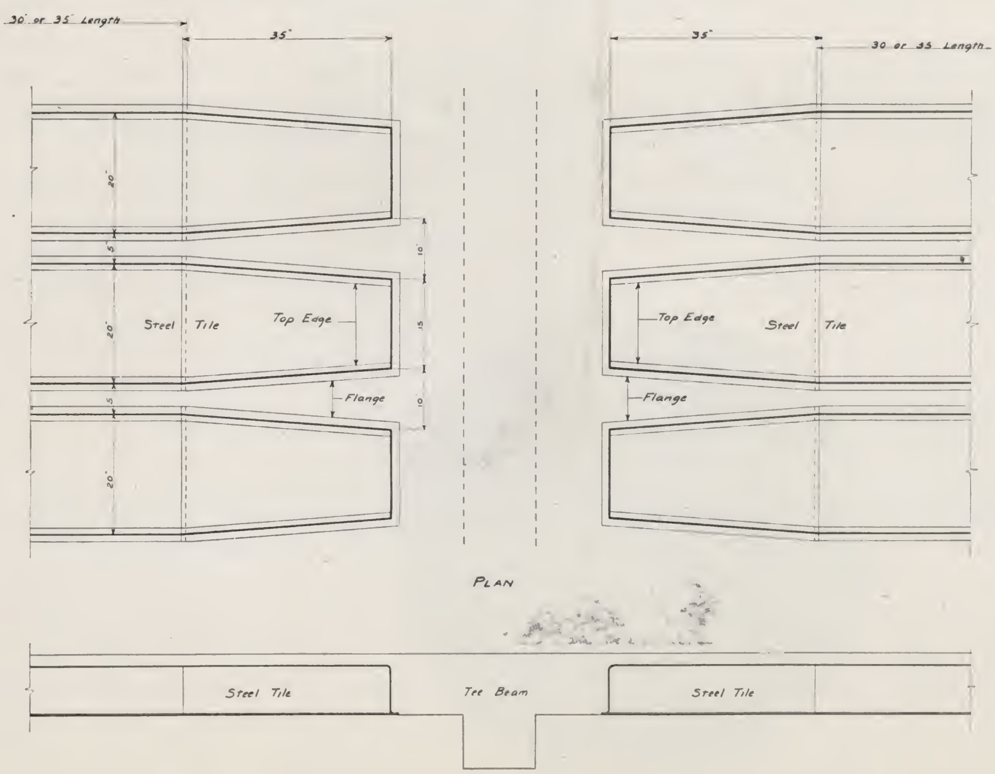


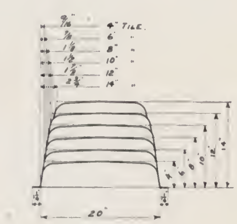
GF Steel-Tile Floor with Concrete Beam



GF Steel-Tile Floor with Steel Beam





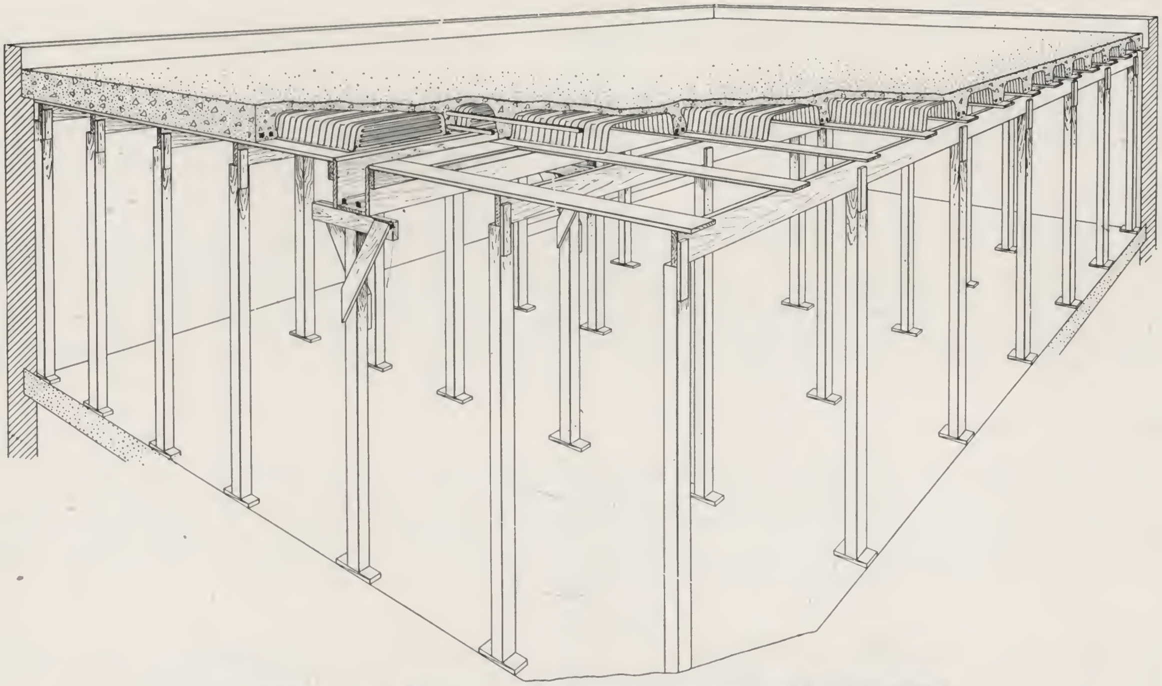


Cross Section Steel Tile 30 & 35" Lengths

Tapered Steel Tile Made in 10", 12" & 14" Sizes, Only

SECTION

Showing Application of Tapered Tile to Increase Shear Area



Showing Economy of Forms and Lightness of Construction with GF Steel-Tile

General Specifications for Reinforced Concrete

Additional Copies Furnished on Request

THE floors and roofs shall consist of the GF Steel-Tile system of reinforced concrete construction, as shown on the accompanying plans, and all materials and workmanship shall be in strict accordance with these plans and specifications.

The Contractor shall, at all times during the progress of the work, provide a competent foreman who is thoroughly experienced in reinforced concrete construction, whose duty it will be to see that these plans and specifications are carried out. The Architect reserves the right, at any time, to discharge any incompetent or careless employee; and such employee shall not be reinstated upon the work without special permission in writing from the Architect. The Architect, or his authorized representative, shall at all times have complete access to the work and the Contractor shall place at his disposal every facility for the inspection of material and workmanship.

Materials and Workmanship

The object of these specifications is to provide a first class structure and all work shall be done in a thorough and businesslike manner. All materials shall be in strict accordance with these specifications, and any materials rejected by the Architect must be immediately removed from the vicinity of the work.

Cement

The cement used in this work shall be Portland Cement and must conform to the standard specifications of the American Society for Testing Materials. All cement shall be tested as directed by the Architect before being brought to the vicinity of the work, and the Contractor must provide ample time for performing these tests so that no delay in the work will be occasioned.

Sand

The sand used for the concrete shall be sharp graded bank or lake sand screened to pass through a ¼″ screen and proportionately graded from fine to coarse, with the coarse grain predominating. All sand shall be free from loam, vegetable or other injurious matter and it shall contain not more than 4% of clay.

Stone and Gravel

The stone shall be clean crushed stone reasonably free from crusher dust, and free from loam, vegetable or other injurious matter.

The gravel shall be washed clean.

Both stone and gravel shall pass through a 1″ screen and be retained on a ¼″ screen.

Steel-Tile

The Steel-Tile shall be GF Steel-Tile as manufactured by The General Fireproofing Company of Youngstown, Ohio. The tile shall be of the sizes indicated on the drawings and must be used strictly in accordance with these specifications. The Steel-Tile shall be accurately spaced to secure the joist area called for, and must be tacked securely to the centering with light nails to prevent movement while the concrete is being poured. The ceiling hangers must be placed and properly adjusted according to detail before the concrete work is commenced.

Reinforcing Steel

The reinforcing steel shall comply with the standard specifications of the American Steel Manufacturers Association. All reinforcing members shall be accurately located in the forms and secured firmly against displacement. They shall have a protection of concrete or cement mortar not less than 2″ thick for hooped or plain reinforced columns and 1½″ thick on the bottom and sides of girders and beams, ⅝″ on the bottom of floor slabs, and 1″ on the bottom of Steel-Tile joists.

Proportion and Placing of Concrete

All concrete shall be mixed in proportion of 1 cu. ft. of cement, 2 cu. ft. of sand and 4 cu. ft. of stone. One barrel of cement shall be considered as 3.8 cu. ft. by volume. Before pouring concrete, each piece of the steel reinforcement must be thoroughly fastened in its proper place and must be held there until the pouring is completed. Concrete shall be mixed by an approved batch mixer, and must be conveyed to place in such manner that no separation of the ingredients occurs. Concrete shall be deposited before the initial set takes place and the work shall be so laid out that partially set concrete will not be disturbed by trucking or wheeling over it.

When concreting is once started, it shall be carried on as a continuous operation until the pouring of the section or panel is completed. If the concreting should be stopped, care must be taken to stop the work at such a point that joints formed when the work is resumed will not weaken the members structurally.

All columns are to be filled at least three hours ahead of the floor construction to allow the concrete in the column to properly settle. The filling of the column must be in one continuous operation to the level of the bottom of the girder or beam supported by it.

In pouring columns the concrete is to be kept well stirred or puddled with a long pole or rod to prevent voids and honey-combing; filling the columns completely and puddling afterwards will not be allowed.

All beams shall be poured so as to be monolithic with the adjacent slab, that is, poured continuously from the bottom of the beam to the top of the slab. When fresh concrete joins concrete that is set, or partially set, the exposed surface of the old concrete shall be thoroughly cleaned and be given a grout coating of neat cement before any concrete is poured.

Concrete laid during hot weather shall be thoroughly wet with clean water and be continually moistened during the first seven days after placing.

Concrete work shall not be permitted when the temperature is 32° Fahrenheit or less, unless sufficient precaution is taken to prevent the concrete from freezing after having been put in place. No frozen materials shall be used.

Extreme care must be taken in the removal of forms under concrete that has been frozen, and forms shall not be removed until it is assured that the moisture has left the concrete and it has obtained its permanent set.

Forms

All forms shall be strong and rigid and sufficiently watertight to prevent leakage of mortar.

Care should be taken to insure that all debris is removed from forms and that they are thoroughly wetted before concrete is deposited in them. Column forms shall be so designed that they may be removed without disturbing the beam and slab forms, and cleanout holes shall be provided in the bottom when necessary to insure the removal of wood chips or other debris. Beam forms shall be so designed that the sides

may be removed without disturbing the bottom, and on long spans they shall be given a slight camber to take care of unavoidable settlement when pouring the concrete.

The time for the removal of forms shall vary with the design and with the temperature. Two weeks of good drying weather with a temperature above 60° shall be taken as the standard for the removal of forms carrying dead load, and three days of good drying weather with a temperature above 60° shall be taken as the standard for the removal of vertical forms carrying no dead weight. Beams and girders of 25-foot span or over shall be considered as special cases and shall be subject to the inspection of the Superintendent before removal of the support.

All reinforced concrete shall be carefully inspected to insure its soundness and reliability before main supports are removed.

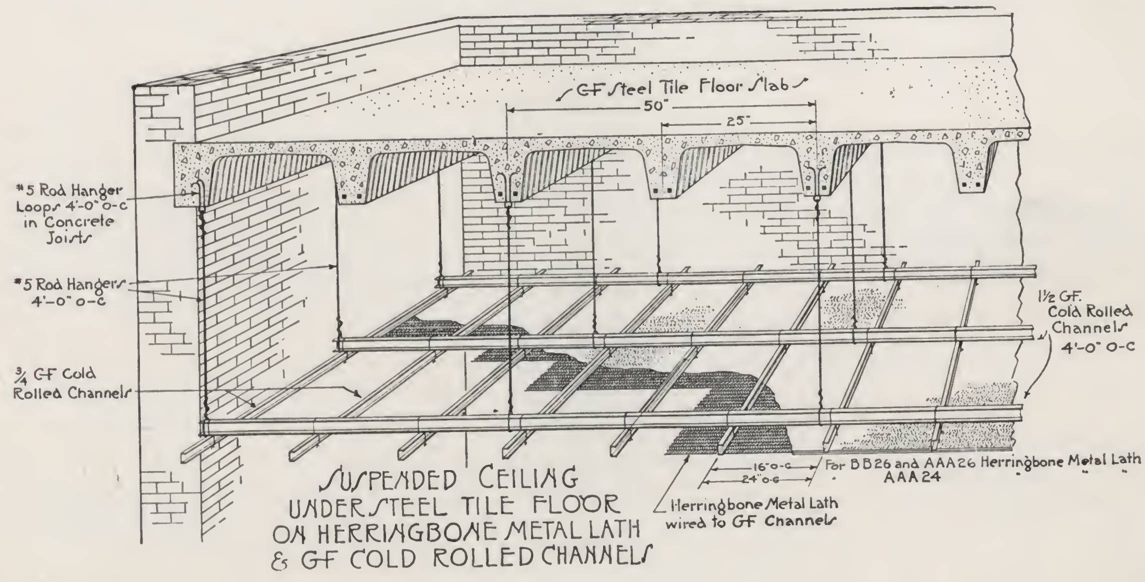
Special care shall be taken on the removal of forms under concrete that has set and cured during freezing weather. Concrete which has been accidentally frozen during the process of setting shall be thawed out and kept heated until it is assured that the concrete has thoroughly set. Sufficient water shall be added to the concrete during the process of thawing and setting to insure the hydration of the cement.

Loading Tests

The Contractor shall at his own expense provide sufficient material and labor to make not more than two loading tests to such portions of the building as the Architect may select. Said tests must be made within a reasonable time after the forms are removed, and must show that the floors are capable of sustaining twice the figured live load without cracking or undue deflection. One month of good drying weather after removal of the forms will be taken as the proper time for the making of such tests.

Metal Lath Ceiling Construction

When the forms are completed and before the placing of the Steel-Tile, AAA 24 Gauge Herringbone Lath shall be placed over the forms with the ribs running at right angles to the line of the joist. The Steel-Tile and reinforcing steel shall then be placed and the Herringbone Lath wired to the reinforcing steel with 14 Gauge wire at intervals of 9″. The concrete shall then be poured.



Suspended Ceiling

Where a suspended ceiling is required, No. 5 Rod Hangers shall be suspended from the concrete joists spaced about 4 feet on centers, as shown on the accompanying detail. After the concrete floor is completed, 1½″ GF Cold Rolled Steel Channels 4′ o-c, shall be fastened to the bottom of the hangers and properly leveled. When this is done, wire ¾″ GF Cold Rolled Steel Channels to the underside of the 1½″ channels, spacing them 24″ on centers and under these, wire securely AAA 24 Gauge Herringbone Lath with the ribs running at right angles to the line of the ¾″ channels.

Explanation of GF Steel-Tile Tables

THE tables on the pages that follow give safe live loads in pounds per square foot for the GF Steel-Tile Floor System. The weight of the floor slab has been deducted and the loads given are the safe loads with a factor of safety of 4 and a moment of Wl/10 for the GF Steel-Tile floor slabs, with a thickness of concrete shown without floor finish or ceiling. Additional loads such as concrete finish or wood floor on sleepers and the ceiling underneath the floor slab should be deducted from the load given to obtain the safe net live loads.

Three different combinations of stresses in steel and concrete are given, and in no case does the floor load given exceed the stresses under which they are listed. Fireproofing of all reinforcing steel has been taken as one inch clear from the bottom of the joist to the surface of steel with a similar thickness over the surfaces of steel at the side of all joists. The distance center to center of the steel reinforcing bars in each joist should not be less than 2½ times the nominal diameter or size of a bar. This spacing allows the concrete to flow freely around the reinforcing, assuring a perfect bond for the steel and the safe transmission of all stresses.

The tables are calculated for square bars only, but round bars may readily be substituted. See tables, pages 15 to 21, inclusive.

The heavy lines shown in these tables are drawn with the vertical shearing force producing an average shearing stress of 60 pounds per square inch on a total area of concrete joist above the center of the reinforcing steel. In all cases, above and to the right of this line the additional web shearing stresses should be cared for by using stirrups, other suitable reinforcement, or with tapered tile.

A small amount of steel should always be placed in the top of the slab at right angles to the joist to prevent cracks in the concrete from contraction or expansion after setting. ¼″ or ⅜″ round bars spaced from 18 to 24″ on centers, are commonly used for this purpose.

Example

Let it be required to design a steel-tile floor with a span of 20′ to support a net live load of 80 lbs. per square foot. If the weight of the ceiling is assumed to be 8 lbs. per square foot, and the weight of the floor finished 12 lbs. per square foot, the total weight of the supported load will be 100 lbs. per square foot. Assuming a bending moment of Wl/10 it will be found from the tables that the following designs will be suitable with a stress of 650 lbs. in the concrete and 16,000 lbs. in the steel.

SIZE	BARS	STRENGTH	DEAD WEIGHT
8″ Steel-Tile plus 2″ con.	⅞″ sq. plus ¾″ sq.	115 lbs. sq. ft.	49.4 lbs. per sq. ft.
10″ Steel-Tile plus 2″ con.	¾″ sq. plus ¾″ sq.	119 lbs. sq. ft.	57.1 lbs. per sq. ft.
12″ Steel-Tile plus 2″ con.	¾″ sq. plus ⅝″ sq.	112 lbs. sq. ft.	65.3 lbs. per sq. ft.

By observing the shear line in the tables it will be seen that all shearing stresses are cared for by the area of concrete in the joists. When stirrups are necessary they may be calculated by reference to formula 1, page 25. For economical design, the designer will compute the cost of Steel-Tile, concrete and reinforcing in place for each thickness of slabs and will select the cheapest one. In comparison the form work need not be taken into consideration.

On page 27, typical Steel-Tile Floor computation is given to illustrate the use of the common formula for reinforced concrete design.

4″ Steel-Tile + 2½″ Concrete

Safe Live Load Uniformly Distributed per Square Foot

5″ Joists at 25″ C. to C.
Weight per Square Foot of Slab Area = 42.2 Pounds.
Concrete per Square Foot of Slab Area = .293 Cubic Feet.
Core Area of Section = 46.0 per cent.
RM_s = Resisting Moment of Steel in Foot Pounds for Steel in One Joist. Shear Area = 31.6 sq. inches.

Bending Moment $= \frac{Wl}{10}$

Stresses	f_c = 650 lb/□″ : f_s = 16000 lb/□″					f_c = 700 lb/□″ : f_s = 18000 lb/□″					f_c = 750 lb/□″ : f_s = 20000 lb/□″				
RMs	2502	3167	3963	4780	5705	2076	2815	3563	4458	5378	2308	3128	3958	4953	5976
Steel Area Sq. In.	.3906	.500	.6406	.7812	.9531	.2812	.3906	.5000	.6406	.7812	.2812	.3906	.5000	.6406	.7812
Sq. Bar Sizes: Straight	1-½	1-½	1-⅝	1-⅝	1-¾	1-⅜	1-½	1-½	1-⅝	1-⅝	1-⅜	1-½	1-½	1-⅝	1-⅝
Sq. Bar Sizes: Bent	1-⅜	1-½	1-½	1-⅝	1-⅝	1-⅜	1-⅜	1-½	1-½	1-⅝	1-⅜	1-⅜	1-½	1-½	1-⅝
Span Length in Feet: 5	439	567	720			357	499	643			402	561	719		
6	292	379	487	595		235	333	433	554		265	374	487	618	
7	203	268	347	427		165	234	307	395	485	184	264	347	443	544
8	145	196	256	317	387	114	168	225	294	362	130	193	255	370	407
9	107	145	193	242	297	80	124	169	223	277	94	143	193	251	312
10	78	110	148	187	232	58	93	129	178	217	69	108	148	195	245
11	58	84	115	148	184	40	70	99	135	172	49	82	115	154	195
12		64	90	117	148		52	77	106	136	35	62	90	123	157
13		48	70	93	120		38	59	84	110		47	70	99	128
14		36	56	74	98			45	67	89		34	56	79	104
15			43	60	79			34	53	73			42	63	85
16			32	48	64				42	59			32	50	61
17				37	53					47				40	57
18					44					38				32	46
19					34										37

4″ Steel-Tile + 2″ Concrete

Safe Live Load Uniformly Distributed per Square Foot

5″ Joists at 25″ C. to C.
Weight per Square Foot of Slab Area = 36.1 Pounds.
Concrete per Square Foot of Slab Area = .251 Cubic Feet.
Core Area of Section = 49.8 per cent.
RM_s = Resisting Moment of Steel in Foot Pounds for Steel in One Joist. Shear Area = 28.2 sq. inches.

Bending Moment $= \frac{Wl}{10}$

Stresses	f_c = 650 lb/□″ : f_s = 16000 lb/□″					f_c = 700 lb/□″ : f_s = 18000 lb/□″					f_c = 750 lb/□″ : f_s = 20000 lb/□″				
RMs	1664	2260	2853	3570	4301	1872	2542	3210	4016	4839	2080	2825	3567	4462	5377
Steel Area Sq. In.	.2812	.3906	.500	.6406	.7812	.2812	.3906	.500	.6406	.7812	2812	.3906	.500	.6406	.7812
Sq. Bar Sizes: Straight	1-⅜	1-½	1-½	1-⅝	1-⅝	1-⅜	1-½	1-½	1-⅝	1-⅝	1-⅜	1-½	1-½	1-⅝	1-⅝
Sq. Bar Sizes: Bent	1-⅜	1-⅜	1-½	1-½	1-⅝	1-⅜	1-⅜	1-½	1-½	1-⅝	1-⅜	1-⅜	1-½	1-½	1-⅝
Span Length in Feet: 5	284	396	514			321	454	583			364	507			
6	186	264	381	440		213	304	394	501		241	341	440		
7	126	185	233	314	386	146	214	279	358	436	167	240	314	475	
8	89	133	179	231	286	104	155	205	265	326	120	176	231	335	366
9	62	94	133	211	219	74	115	195	293	250	88	132	176	265	281
10	44	82	100	135	170	53	87	118	156	195	64	100	135	178	221
11	30	54	76	105	135	38	65	92	123	155	46	75	106	141	176
12		39	59	83	107		49	71	97	125	34	58	82	113	143
13			45	65	86		37	55	78	102		44	65	90	116
14			34	52	69			43	61	83		34	51	73	96
15				40	55			33	49	68			40	59	79
16				31	44				39	54			31	48	64
17					35					44				38	53
18										36					44
19															36

NOTE—In the above and the following tables, heavy lines are drawn for a vertical shearing force producing an average shearing stress of 60 lb. per sq. in. on the concrete. Tapered tile should be used for all loads above and to the right of these lines.

6″ Steel-Tile + 2½″ Concrete

Safe Live Load Uniformly Distributed per Square Foot

5″ Joists at 25″ C. to C.
Weight per Square Foot of Slab Area = 48.3 Pounds.
Concrete per Square Foot of Slab Area = .335 Cubic Feet.
Core Area of Section = 52.6 per cent.
RM_s = Resisting Moment of Steel in Foot Pounds for Steel in One Joist. Shear Area = 45.5 sq. inches.

Bending Moment = $\frac{Wl}{10}$

Stresses	f_c = 650 lb/□″ : f_s = 16000 lb/□″					f_c = 700 lb/□″ : f_s = 18000 lb/□″					f_c = 750 lb/□″ : f_s = 20000 lb/□″				
RMs	5578	6738	8069	9435	10944	4987	6275	7580	9078	10614	5542	6972	8422	10087	11794
Steel Area Sq. In.	6406	.7812	.9531	1.125	1.328	.500	.6406	.7812	.9531	1.125	.500	.6406	.7812	.9531	1.125
Sq. Bar Sizes: Straight	1-⅝	1-⅝	1-¾	1-¾	1-⅞	1-½	1-⅝	1-⅝	1-¾	1-¾	1-½	1-⅝	1-⅝	1-¾	1-¾
Sq. Bar Sizes: Bent	1-½	1-⅝	1-⅝	1-¾	1-¾	1-½	1-½	1-⅝	1-⅝	1-¾	1-½	1-½	1-⅝	1-⅝	1-¾
Span Length in Feet. 10	220	279	340	405	478	191	253	316	389	462	218	287	357	437	
11	173	220	273	327	387	150	201	253	313	374	172	229	287	352	421
12	138	177	221	267	317	118	161	205	255	307	137	187	233	289	346
13	111	144	182	221	264	94	131	168	211	257	110	151	192	239	288
14	89	117	150	183	221	74	106	138	175	213	88	123	159	199	242
15	71	96	124	153	185	59	86	114	146	179	70	101	132	167	204
16	57	79	103	129	157	46	70	94	122	151	56	83	110	141	174
17	45	64	86	109	134	35	56	78	103	129	44	68	92	120	148
18	35	52	71	92	114		45	64	86	109	34	55	77	102	127
19		42	59	77	97		35	53	73	93		45	64	86	109
20		33	49	65	83			43	61	80		36	53	73	94
21			40	54	71			35	51	68			44	63	80
22			32	45	60				42	57			35	52	69
23				38	51				35	48				43	59
24					43					41				36	50
25					36					34					43
26															36

6″ Steel-Tile + 2″ Concrete

Safe Live Load Uniformly Distributed per Square Foot

5″ Joists at 25″ C. to C.
Weight per Square Foot of Slab Area = 42.3 Pounds.
Concrete per Square Foot of Slab Area = .239 Cubic Feet.
Core Area of Section = 55.9 per cent.
RM_s = Resisting Moment of Steel in Foot Pounds for Steel in One Joist. Shear Area = 41.8 sq. inches.

Bending Moment = $\frac{Wl}{10}$

Stresses	f_c = 650 lb/□″ : f_s = 16000 lb/□″					f_c = 700 lb/□″ : f_s = 18000 lb/□″					f_c = 750 lb/□″ · f_s = 20000 lb/□″				
RMs	4120	5167	6250	7484	8789	4635	5813	7030	8420	9888		5150	6459	7812	9356
Steel Area Sq. In.	.500	.6406	.7812	.9531	1.125	.500	.6406	.7812	.9531	1.125		.500	.6406	.7812	.9530
Sq. Bar Sizes: Straight	1-½	1-⅝	1-⅝	1-¾	1-¾	1-½	1-⅝	1-⅝	1-¾	1-¾		1-½	1-⅝	1-⅝	1-¾
Sq. Bar Sizes: Bent	1-½	1-½	1-⅝	1-⅝	1-¾	1-½	1-½	1-⅝	1-⅝	1-¾		1-½	1-½	1-⅝	1-⅝
Span Length in Feet. 10	156	206	258	318	381	180	237	296	363	433		206	268	333	408
11	122	163	206	256	307	142	189	237	292	350		162	215	268	330
12	95	130	167	208	251	113	152	192	239	288		130	174	219	270
13	75	105	136	171	208	90	123	158	197	239		104	142	180	224
14	59	85	111	142	173	72	100	130	165	200		84	116	150	188
15	46	68	91	118	146	57	82	108	138	169		68	96	125	158
16	35	55	75	98	123	45	67	90	116	143		55	79	104	133
17		44	62	82	104	35	55	75	98	122		44	65	88	114
18		35	51	69	88		44	62	83	104		34	54	74	97
19			41	58	75		36	52	70	89			44	62	82
20			33	48	63			42	59	76			36	52	70
21				39	54			35	50	66				43	60
22					45				41	56				35	51
23					37				34	48					43
24										40					36
25										34					

NOTE—In the above and the following tables, heavy lines are drawn for a vertical shearing force producing an average shearing stress of 60 lb. per sq. in. on the concrete. Tapered tile should be used for all loads above and to the right of these lines.

8″ Steel-Tile + 2½″ Concrete

Safe Live Load Uniformly Distributed per Square Foot

5″ Joists at 25″ C. to C.
Weight per Square Foot of Slab Area = 55.1 Pounds.
Concrete per Square Foot of Slab Area = .382 Cubic Feet.
Core Area of Section = 56.3 per cent.
RM_s = Resisting Moment of Steel in Foot Pounds for Steel in One Joist. Shear Area = 60.85 sq. inches.

Bending Moment = $\frac{Wl}{10}$

Stresses	f_c = 650 ℔/□″ : f_s = 16000 ℔/□″					f_c = 700 ℔/□″ : f_s = 18000 ℔/□″					f_c = 750 ℔/□″ : f_s = 20000 ℔/□″				
RMs	8697	10457	12285	14325	16455	8091	9784	11764	13821	16093	8990	10871	13071	15357	17861
Steel Area Sq. In.	.7812	.9531	1.125	1.328	1.531	.6406	.7812	.9531	1.125	1.328	.6406	.7812	.9531	1.125	1.328
Sq. Bar Sizes: Straight	1-⅝	1-¾	1-¾	1-⅞	1-⅞	1-⅝	1-⅝	1-¾	1-¾	1-⅞	1-⅝	1-⅝	1-¾	1-¾	1-⅞
Sq. Bar Sizes: Bent	1-⅝	1-⅝	1-¾	1-¾	1-⅞	1-½	1-⅝	1-⅝	1-¾	1-¾	1-½	1-⅝	1-⅝	1-¾	1-¾
Span Length in Feet. 10	363	449	535	634		334	415	510	610		377	468	575		
11	290	361	433	515	597	266	334	402	494	584	302	376	465	556	
12	235	294	355	423	495	215	272	338	407	482	245	308	382	458	541
13	192	242	294	353	413	175	223	279	338	403	201	254	317	382	453
14	158	202	246	297	349	143	185	234	284	340	165	212	266	322	383
15	133	171	207	251	297	118	154	196	240	289	137	177	224	273	327
16	108	141	176	213	254	97	128	166	204	247	114	149	191	233	281
17	90	119	149	183	219	83	108	141	175	213	94	126	162	200	242
18	74	100	127	158	189	65	90	119	150	184	78	106	139	173	210
19	60	84	108	136	164	53	75	102	129	159	65	90	119	150	183
20	49	70	93	117	143	42	62	86	111	138	53	75	102	130	160
21	40	59	79	101	124	33	52	73	96	120	43	64	87	112	140
22		49	67	87	108		41	62	82	105	34	53	75	97	122
23		40	56	75	94			52	71	91		44	64	84	107
24			47	64	82			43	60	79		36	54	73	94
25			39	55	71			35	51	68			46	63	82
26				47	62				43	59			38	53	72
27				39	54				36	51				46	63
28					46					44				39	54
29					39					37					47
30															40

8″ Steel-Tile + 2″ Concrete

Safe Live Load Uniformly Distributed per Square Foot

5″ Joists at 25″ C. to C.
Weight per Square Foot of Slab Area = 49.4 Pounds.
Concrete per Square Foot of Slab Area = .342 Cubic Feet.
Core Area of Section = 59.2 per cent.
RM_s = Resisting Moment of Steel in Foot Pounds for Steel in One Joist. Shear Area = 56.9 sq. inches.

Bending Moment = $\frac{Wl}{10}$

Stresses	f_c = 650 ℔/□″ : f_s = 16000 ℔/□″					f_c = 700 ℔/□″ : f_s = 18000 ℔/□″					f_c = 750 ℔/□″ : f_s = 20000 ℔/□″				
RMs	6799	8250	9938	11700	13653	7649	9281	11180	13162	15359	6734	8500	10312	12422	14628
Steel Area Sq. In.	.6406	.7812	.9531	1.125	1.328	.6406	.7812	.9531	1.125	1.328	.500	.6406	.7812	.9531	1.125
Sq. Bar Sizes: Straight	1-⅝	1-⅝	1-¾	1-¾	1-⅞	1-⅝	1-⅝	1-¾	1-¾	1-⅞	1-½	1-⅝	1-⅝	1-¾	1-¾
Sq. Bar Sizes: Bent	1-½	1-⅝	1-⅝	1-¾	1-¾	1-½	1-⅝	1-⅝	1-¾	1-¾	1-½	1-½	1-⅝	1-¾	1-¾
Span Length in Feet. 10	278	348	428	514	604	318	397	488	584		274	359	447	548	
11	221	279	345	416	494	255	319	395	475	563	219	289	361	444	532
12	178	226	282	342	407	206	261	325	390	464	176	235	296	366	439
13	144	186	234	284	340	169	215	270	326	388	143	193	245	305	368
14	118	154	195	238	286	139	179	215	274	328	116	159	203	256	310
15	97	127	163	201	243	114	149	190	232	279	95	133	171	216	264
16	78	106	137	171	207	95	125	161	198	239	77	111	145	184	226
17	64	88	116	146	178	78	105	137	170	206	63	92	122	158	194
18	51	72	98	124	153	64	88	117	146	179	51	77	104	135	168
19	41	61	83	107	133	53	75	100	126	155	41	64	88	116	146
20	33	50	70	91	115	43	62	85	109	136	32	53	75	100	127
21		41	59	78	99	34	52	73	94	118		44	62	86	110
22		33	50	67	86		43	62	82	104		35	54	74	96
23			41	57	75		35	53	70	91			45	64	84
24			34	49	65			44	61	79			37	55	73
25				41	56			37	52	69				47	64
26				34	48				45	60				39	55
27					41				38	52					47
28					35					45					41
29										39					35

Note—In the above and the following tables, heavy lines are drawn for a vertical shearing force producing an average shearing stress of 60 lb. per sq. in. on the concrete. Tapered tile should be used for all loads above and to the right of these lines.

10″ Steel-Tile + 2½″ Concrete

Safe Live Load Uniformly Distributed per Square Foot

5″ Joists at 25″ C. to C..
Weight per Square Foot of Slab Area = 63.2 Pounds.
Concrete per Square Foot of Slab Area = .438 Cubic Feet.
Core Area of Section = 58.0 per cent.
RM_s = Resisting Moment of Steel in Foot Pounds for Steel in One Joist. Shear Area = 80.0 sq. inches.

Bending Moment $= \frac{Wl}{10}$

Stresses	f_c = 650 lb/□″ : f_s = 16000 lb/□″					f_c = 700 lb/□″ : f_s = 18000 lb/□″					f_c = 750 lb/□″ : f_s = 20000 lb/□″				
RMs	12911	15180	17760	20436	23376	12034	14525	17078	19980	22990	13371	16139	18976	22200	25544
Steel Area Sq. In.	.9531	1.125	1.328	1.531	1.766	.7812	.9531	1.125	1.328	1.531	.7812	.9531	1.125	1.328	1.531
Sq. Bar Sizes: Straight	1-¾	1-¾	1-⅞	1-⅞	1-1	1-⅝	1-¾	1-¾	1-⅞	1-⅞	1-⅝	1-¾	1-¾	1-⅞	1-⅞
Sq. Bar Sizes: Bent	1-⅝	1-¾	1-¾	1-⅞	1-⅞	1-⅝	1-⅝	1-¾	1-¾	1-⅞	1-⅝	1-⅝	1-¾	1-¾	1-⅞
Span Length in Feet. 11	450	539	643	750		415	515	617	732		469	579	695		
12	368	444	530	612		339	422	507	605	705	384	476	571	675	
13	305	369	443	518	602	279	350	423	506	591	318	396	477	569	664
14	254	310	372	439	510	232	294	356	427	501	265	333	403	482	564
15	213	261	317	374	437	194	247	302	364	428	223	282	343	411	483
16	179	222	271	321	376	163	213	257	312	369	188	242	295	354	417
17	152	192	233	277	326	137	179	221	270	322	159	205	253	307	362
18	129	162	201	241	284	115	153	194	234	279	136	177	219	267	317
19	109	139	174	209	248	97	130	164	203	243	115	152	192	233	277
20	92	119	150	182	218	81	111	142	177	213	98	131	165	204	244
21	78	102	131	157	192	68	95	123	155	197	83	113	144	179	216
22	65	88	113	140	170	56	81	107	137	165	69	97	126	157	190
23	54	75	98	121	149	46	69	92	119	146	59	84	109	139	169
24	45	64	85	108	132	37	58	79	104	129	49	72	95	122	150
25	36	54	74	93	115		53	68	91	114	40	61	83	108	133
26		45	63	82	103		40	58	79	100		52	72	95	119
27		37	54	72	91			49	69	88		43	62	83	105
28			46	62	80			41	60	81		36	53	73	94
29			39	54	71			35	51	68			45	64	83
30				46	62				44	60			38	56	73
31				39	54				37	52				48	65
32					47					45				41	57
33					40					38				35	50
34															43

10″ Steel-Tile + 2″ Concrete

Safe Live Load Uniformly Distributed per Square Foot

5″ Joists at 25″ C. to C
Weight per Square Foot of Slab Area = 57.1 Pounds.
Concrete per Square Foot of Slab Area = .396 Cubic Feet
Core Area of Section = 60.3 per cent.
RM_s = Resisting Moment of Steel in Foot Pounds for Steel in One Joist. Shear Area = 75.6 sq. inches.

Bending Moment $= \frac{Wl}{10}$

Stresses	f_c = 650 lb/□″ · f_s = 16000 lb/□″					f_c = 700 lb/□″ : f_s = 18000 lb/□″					f_c = 750 lb/□″ : f_s = 20000 lb/□″				
RMs	8455	10280	12428	14640	17141	9512	11565	13981	16470	19284	10569	12850	15534	18300	21427
Steel Area Sq. In.	.6406	.7812	.9531	1.125	1.328	.6406	.7812	.9531	1.125	1.328	.6406	.7812	.9531	1.125	1.328
Sq. Bar Sizes: Straight	1-⅝	1-⅝	1-¾	1-¾	1-⅞	1-⅝	1-⅝	1-¾	1-¾	1-⅞	1-⅝	1-⅝	1-¾	1-¾	1-⅞
Sq. Bar Sizes: Bent	1-½	1-⅝	1-⅝	1-¾	1-¾	1-½	1-⅝	1-⅝	1-¾	1-¾	1-½	1-⅝	1-⅝	1-¾	1-¾
Span Length in Feet. 10	349	437	541	647	767	400	499	615	735		451	561	690	822	
11	279	353	437	525	625	321	402	499	598	713	363	454	560	670	
12	225	286	358	432	516	261	329	410	493	587	298	372	462	554	.659
13	184	235	296	360	431	213	272	341	412	492	244	309	386	464	553
14	151	195	248	302	364	176	227	286	347	416	203	259	324	392	469
15	124	163	209	256	309	146	190	242	295	355	169	218	275	334	401
16	102	136	176	218	265	121	160	205	253	305	142	184	235	287	346
17	84	114	150	187	228	101	135	178	217	264	119	157	202	248	300
18	68	96	128	160	197	84	114	151	188	229	100	134	174	215	261
19	56	80	108	138	171	69	97	129	162	200	84	114	150	187	228
20	44	66	92	119	149	57	82	111	141	175	70	97	130	163	200
21	35	55	78	103	130	46	69	95	122	153	58	83	112	143	177
22		45	67	88	113	37	58	82	107	135	48	71	98	125	157
23		36	56	76	98		48	70	93	118	39	60	84	109	138
24			46	65	86		39	59	80	104		50	72	96	122
25			39	55	75			51	69	91		42	62	84	108
26				47	65			42	60	80		34	53	73	95
27				40	56			35	51	70			45	64	84
28					48				44	61			38	55	74
29					41				37	53				47	65
30										46				41	56
31										39				34	50
32															43
33															38

NOTE—In the above and the following tables, heavy lines are drawn for a vertical shearing force producing an average shearing stress of 60 lb. per sq. in. on the concrete. Tapered tile should be used for all loads above and to the right of these lines.

12″ Steel-Tile + 2½″ Concrete

Safe Live Load Uniformly Distributed per Square Foot

5″ Joists at 25″ C. to C.
Weight per Square Foot of Slab Area = 71.4 Pounds.
Concrete per Square Foot of Slab Area = .495 Cubic Feet.
Core Area of Section = 59.2 per cent.
RM_s = Resisting Moment of Steel in Foot Pounds for Steel in One Joist. Shear Area = 98.62 sq. inches.

Bending Moment = $\frac{Wl}{10}$

Stresses	f_c = 650 lb/□″ : f_s = 16000 lb/□″					f_c = 700 lb/□″ : f_s = 18000 lb/□″					f_c = 750 lb/□″ : f_s = 20000 lb/□″				
RM_s	15750	18150	21240	24490	28010	17720	20420	23895	27550	31510	15905	19690	22690	26550	30600
Steel Area Sq. In.	.9531	1.125	1.328	1.531	1.766	.9531	1.125	1.328	1.531	1.7656	.7812	.9531	1.125	1.328	1.531
Sq. Bar Sizes, Straight	1-¾	1-¾	1-⅞	1-⅞	1-1	1-¾	1-¾	1-⅞	1-⅞	1-1	1-⅝	1-¾	1-¾	1-⅞	1-⅞
Sq. Bar Sizes, Bent	1-⅝	1-¾	1-¾	1-⅞	1-⅞	1-⅝	1-¾	1-¾	1-⅞	1-⅞	1-⅝	1-⅝	1-¾	1-¾	1-⅞
Span Length in Feet: 13	375	443	532	624	724	431	509	607	711	824	382	488	573	682	797
14	315	373	449	529	616	363	429	514	604	701	319	411	485	579	679
15	264	316	382	451	526	307	364	439	517	601	267	349	413	495	582
16	224	269	327	386	454	261	312	377	445	520	227	297	354	427	503
17	190	230	282	336	394	223	267	326	387	452	193	256	306	370	438
18	165	197	243	295	343	193	231	283	337	396	164	220	265	322	382
19	137	169	210	253	301	164	200	246	295	347	140	190	230	282	335
20	117	146	183	223	264	141	174	215	260	307	119	165	204	247	296
21	99	127	160	195	233	121	150	188	228	272	102	143	175	217	262
22	84	108	139	171	206	89	131	165	201	241	86	123	153	195	232
23	71	93	121	151	183	76	114	145	178	215	73	107	134	169	206
24	60	80	106	133	162	64	99	128	158	191	61	93	118	150	184
25	49	68	91	117	143	54	85	112	140	171	50	80	103	132	163
26	40	57	79	102	127	45	73	98	124	152	41	68	88	117	146
27		47	68	90	113	37	63	86	110	136	33	58	77	103	130
28		39	58	78	100		53	75	97	121		49	67	91	116
29			50	68	88		45	65	86	108		41	58	80	103
30			41	59	78		37	56	75	96		33	49	70	91
31				51	68			48	66	86		27	42	61	81
32				43	59			40	57	76			35	53	72
33				38	51			33	49	67				45	63
34					44				42	59				38	55
35					38				36	52					48
36										45					42
37										38					36

12″ Steel-Tile + 2″ Concrete

Safe Live Load Uniformly Distributed per Square Foot

5″ Joists at 25″ C. to C.
Weight per Square Foot of Slab Area = 65.3 Pounds.
Concrete per Square Foot of Slab Area = .452 Cubic Feet.
Core Area of Section = 61.2 per cent.
RM_s = Resisting Moment of Steel in Foot Pounds for Steel in One Joist. Shear Area = 93.85 sq. inches.

Bending Moment = $\frac{Wl}{10}$

Stresses	f_c = 650 lb/□″ : f_s = 16000 lb/□″					f_c = 700 lb/□″ : f_s = 18000 lb/□″					f_c = 750 lb/□″ : f_s = 20000 lb/□″				
RM_s	12690	14930	17620	20650	23820	11400	13880	16800	19840	23230	12650	15410	18680	22025	25810
Steel Area Sq. In.	.7812	.9531	1.125	1.328	1.531	.6406	.7812	.9531	1.125	1.328	.6406	.7812	.9531	1.125	1.328
Sq. Bar Sizes, Straight	1-⅝	1-¾	1-¾	1-⅞	1-⅞	1-⅝	1-⅝	1-¾	1-¾	1-⅞	1-⅝	1-⅝	1-¾	1-¾	1-⅞
Sq. Bar Sizes, Bent	1-⅝	1-⅝	1-¾	1-¾	1-⅞	1-½	1-⅝	1-⅝	1-¾	1-¾	1-½	1-⅝	1-⅝	1-¾	1-¾
Span Length in Feet: 10	547	653	783	929		483	603	743	890		544	677	834	993	
11	439	529	635	757	883	389	487	603	723	858	439	548	677	809	965
12	359	433	523	624	730	316	399	496	597	711	358	450	558	669	797
13	296	360	437	523	613	259	330	413	499	595	294	373	467	561	669
14	246	296	367	441	519	214	275	347	420	504	245	313	393	474	567
15	206	254	312	377	444	178	232	293	359	431	205	264	334	405	487
16	173	216	266	323	382	149	195	250	307	371	173	224	286	348	420
17	146	184	228	279	328	124	166	215	265	321	146	191	246	301	366
18	123	156	196	241	288	104	141	184	229	279	123	164	212	262	318
19	104	134	170	210	252	88	120	159	199	245	103	140	184	228	279
20	87	112	147	183	221	72	102	136	173	214	87	120	159	199	245
21	73	98	127	160	194	63	86	118	151	188	73	103	138	174	216
22	61	83	110	140	172	48	73	101	132	166	61	88	120	154	192
23	50	70	95	122	151	38	61	87	115	150	50	75	104	135	170
24	41	60	82	107	134		51	75	100	129	40	63	90	118	150
25		50	70	94	118		41	64	87	113		53	78	104	134
26		41	60	82	104			54	76	100		44	67	91	118
27			51	71	92			46	65	88			58	80	105
28			43	62	81				56	77			49	70	93
29				53	71				48	68			41	60	82
30				45	62				41	59				52	73
31					54					50				45	64
32					47					44					56
33															48

NOTE—In the above and the following tables, heavy lines are drawn for a vertical shearing force producing an average shearing stress of 60 lb. per sq. in. on the concrete. Tapered tile should be used for all loads above and to the right of these lines.

14″ Steel-Tile + 2½″ Concrete

Safe Live Load Uniformly Distributed per Square Foot

5″ Joists at 25″ C. to C.
Weight per Square Foot of Slab Area = 83.3 Pounds.
Concrete per Square Foot of Slab Area = .579 Cubic Feet.
Core Area of Section = 57.9 per cent.
RM_s = Resisting Moment of Steel in Foot Pounds for Steel in One Joist. Shear Area = 128.55 sq. inches.

Bending Moment = $\frac{Wl}{10}$

Stresses	f_c = 650 lb/□″ : f_s = 16000 lb/□″					f_c = 700 lb/□″ : f_s = 18000 lb/□″					f_c = 750 lb/□″ : f_s = 20000 lb/□″				
RMs	24490	28125	32150	36290	40720	23545	27550	31640	36170	40825	26160	30615	35155	40190	45360
Steel Area Sq. In.	1.328	1.531	1.766	2.000	2.266	1.125	1.328	1.531	1.766	2.000	1.125	1.328	1.531	1.766	2.000
Sq. Bar Sizes Straight	1-⅞	1-⅞	1-1	1-1	1-1⅛	1-¾	1-⅞	1-⅞	1-1	1-1	1-¾	1-⅞	1-⅞	1-1	1-1
Sq. Bar Sizes Bent	1-¾	1-⅞	1-⅞	1-1	1-1	1-¾	1-¾	1-⅞	1-⅞	1-1	1-¾	1-¾	1-⅞	1-⅞	1-1
Span Length in Feet. 15	441	518	603	692	787	419	506	594	689	790	476	571	669	776	885
16	377	445	521	599	684	359	435	512	595	682	409	492	577	672	768
17	325	385	452	521	595	309	375	444	519	596	353	426	503	585	671
18	280	335	395	456	522	266	326	386	454	524	305	372	439	514	590
19	243	290	345	401	459	230	284	339	399	461	265	324	385	451	521
20	211	254	304	354	406	200	248	297	351	409	232	285	340	399	462
21	184	224	268	313	361	174	228	262	310	361	202	251	300	355	411
22	160	197	237	277	322	150	191	232	277	323	177	222	267	317	367
23	140	171	209	246	288	131	168	205	246	288	155	196	236	282	330
24	122	152	186	220	258	113	147	181	219	258	136	173	210	253	296
25	105	133	164	196	232	98	129	160	194	231	118	152	188	226	266
26	91	117	146	175	207	84	113	142	174	207	103	135	167	203	240
27	78	102	129	156	186	72	98	126	155	186	89	119	149	182	216
28	67	89	114	140	167	61	86	111	139	167	77	105	132	164	195
29	57	78	101	124	150	51	74	98	124	150	66	92	118	147	176
30	48	67	89	110	135	42	64	86	110	135	56	80	104	132	159
31	39	58	78	98	121	35	55	75	98	121	48	70	92	118	144
32		49	68	87	108		46	65	86	109	40	60	82	105	130
33		41	59	77	96		38	56	76	97	32	52	72	94	117
34		34	50	68	86			48	67	86		44	63	84	105
35			43	59	77			41	58	77		37	55	74	94
36			36	51	68			34	51	68			47	66	85
37				44	60				44	60			40	58	76
38				38	53				38	53			34	51	68
39					45					45				44	60
40					39					39				37	53

14″ Steel-Tile + 2″ Concrete

Safe Live Load Uniformly Distributed per Square Foot

5″ Joists at 25″ C. to C.
Weight per Square Foot of Slab Area = 78.4 Pounds.
Concrete per Square Foot of Slab Area = .537 Cubic Feet.
Core Area of Section = 59.7 per cent.
RM_s = Resisting Moment of Steel in Foot Pounds for Steel in One Joist. Shear Area = 122.5 sq. inches.

Bending Moment = $\frac{Wl}{10}$

Stresses	f_c = 650 lb/□″ : f_s = 16000 lb/□″					f_c = 700 lb/□″ : f_s = 18000 lb/□″					f_c = 750 lb/□″ : f_s = 20000 lb/□″				
RMs	20300	23725	27250	31050	35100	19430	22840	26691	30655	34935	21590	25380	29657	34060	38810
Steel Area Sq. In.	1.125	1.328	1.531	1.766	2.000	.9531	1.125	1.328	1.531	1.766	.9531	1.125	1.328	1.531	1.766
Sq. Bar Sizes Straight	1-¾	1-⅞	1-⅞	1-1	1-1	1-¾	1-¾	1-⅞	1-⅞	1-1	1-¾	1-¾	1-⅞	1-⅞	1-1
Sq. Bar Sizes Bent	1-¾	1-¾	1-⅞	1-⅞	1-1	1-⅝	1-¾	1-¾	1-⅞	1-⅞	1-⅝	1-¾	1-¾	1-⅞	1-⅞
Span Length in Feet. 14	420	504	590	684	785	399	484	576	674	778	451	545	649	756	874
15	356	429	505	586	672	337	411	493	577	668	384	464	556	650	751
16	303	367	434	505	581	285	351	424	497	578	327	399	478	560	651
17	260	317	376	439	506	245	297	366	434	504	281	344	416	495	568
18	223	274	326	384	442	211	261	318	378	442	242	299	363	429	499
19	194	238	285	335	390	181	225	278	330	388	210	260	317	384	439
20	166	207	250	295	345	155	195	244	290	341	181	227	278	332	389
21	143	181	219	261	305	134	171	213	256	303	157	199	245	293	338
22	123	158	197	230	271	115	149	187	227	269	137	174	217	260	308
23	106	137	169	204	241	98	129	164	199	239	117	152	191	232	274
24	92	120	149	181	215	84	112	145	177	214	102	134	170	206	246
25	78	104	132	161	193	71	97	127	158	190	88	117	150	184	220
26	66	90	116	143	171	60	84	111	140	171	75	102	133	164	193
27	56	78	102	127	153	50	72	98	124	152	64	89	118	150	178
28	47	68	89	112	137	41	62	85	111	138	54	77	106	131	160
29	38	57	78	99	123	33	52	74	97	121	45	67	91	116	140
30	30	48	67	87	109		43	64	85	108	37	57	80	104	129
31		40	58	77	97		36	55	75	97		49	70	92	116
32		33	50	68	91			47	66	86		41	61	82	104
33			42	59	77			39	57	76		33	52	72	93
34			35	51	67				49	67			45	64	83
35				43	59				42	59			38	55	74
36				37	52				39	51				48	66
37					45					45				41	58
38					39					38				35	51
39															44
40															38

NOTE—In the above and the following tables, heavy lines are drawn for a vertical shearing force producing an average shearing stress of 60 lb. per sq. in. on the concrete. Tapered tile should be used for all loads above and to the right of these lines.

14″ Steel-Tile + 3″ Concrete

Safe Live Load Uniformly Distributed per Square Foot

5″ Joists at 25″ C. to C.
Weight per Square Foot of Slab Area = 89.5 Pounds.
Concrete per Square Foot of Slab Area = .622 Cubic Feet.
Core Area of Section = 56.2 per cent.

Bending Moment = $\frac{Wl}{10}$

RM_s = Resisting Moment of Steel in Foot Pounds for Steel in One Joist. Shear Area = 132.71 sq. inches.

Stresses	f_c = 650 lb/□″ : f_s = 16000 lb/□″					f_c = 700 lb/□″ : f_s = 18000 lb/□″					f_c = 750 lb/□″ · f_s = 20000 lb/□″				
RMs	25225	28980	33135	37380	41985	28378	32600	37277	42050	47235	26955	31530	36225	41419	46725
Steel Area Sq. In.	1.328	1.531	1.766	2.000	2.266	1.328	1.531	1.766	2.000	2.266	1.125	1.328	1.531	1.766	2.000
Sq. Bar Sizes: Straight	1–⅞	1–⅞	1–1	1–1	1–1⅛	1–⅞	1–⅞	1–1	1–1	1–1⅛	1–¾	1–⅞	1–⅞	1–1	1–1
Sq. Bar Sizes: Bent	1–¾	1–⅞	1–⅞	1–1	1–1	1–¾	1–⅞	1–⅞	1–1	1–1	1–¾	1–¾	1–⅞	1–⅞	1–1
Span Length in Feet.															
17	331	394	462	534	609	383	455	531	611	699	360	436	514	601	689
18	265	341	404	465	533	332	395	465	534	611	310	378	449	526	605
19	247	297	353	409	470	289	345	407	472	540	270	331	394	463	533
20	214	259	310	360	415	252	302	359	416	480	236	290	347	408	473
21	186	227	273	318	369	220	266	317	370	426	205	254	306	363	420
22	162	199	240	283	328	190	235	282	328	381	179	224	272	323	375
23	140	174	212	250	292	169	207	250	294	340	156	198	240	288	337
24	122	153	188	223	261	148	183	222	261	305	136	174	214	256	302
25	105	134	166	198	234	129	162	198	234	274	118	154	190	230	270
26	90	117	147	176	210	112	143	176	210	247	104	135	168	205	243
27	77	102	129	158	188	98	126	157	188	222	89	119	150	184	219
28	66	88	114	140	168	85	111	139	169	200	76	104	133	165	197
29	55	76	100	124	150	73	97	124	150	180	65	92	117	148	178
30	45	65	88	110	135	62	85	109	135	163	54	79	104	134	160
31		55	76	97	120	52	74	97	121	146	45	68	92	118	144
32		47	66	86	108	43	64	85	108	132		58	81	105	130
33			57	76	96		54	75	96	119		50	70	93	117
34			48	66	85		46	66	86	107		42	61	83	105
35			42	57	75		38	57	76	96			53	74	94
36				49	66			49	67	86			45	64	84
37				42	58			41	58	76			38	56	75
38					50				51	68				49	66
39					43				43	60				42	58
40										53					51
41										46					44

List of Prominent GF Steel-Tile Installations

GIMBEL BROS. STORE, Milwaukee, Wis.
H. J. Esser, Architect.
Paul Reisen's Sons, Contractors.

BROWN BLOCK, Madison, Wis.
J. R. Law, Architect.
T. C. McCarthy, Contractor.

VOLRATH OFFICE BUILDING, Sheboygan, Wis.
Brust & Phillips, Architects.
American Contracting Co., Contractors.

SACRED HEART SANITARIUM, Milwaukee, Wis.
Brust & Phillips, Architects.
Paul Reisen's Sons, Contractors.

BROOKS GARAGE, Sioux Falls, S. D.
Jos. Schwarz, Architect.
Sioux Falls Construction Co., Contractors.

RECREATION BUILDING, Detroit, Mich.
Smith, Hinchman & Grylls, Architects.
Porter Bros., Contractors.

COMMERCIAL BUILDING, Bay City, Mich.
A. E. Munger, Architect.
Weber Construction Co., Contractors.

TOLEDO UNIVERSITY, Toledo, Ohio.
Schriber & Beelman, Architects.
John Pioch, Contractor.

LA SALLE & KOCH CO. STORE BUILDING, Toledo, Ohio.
Starrett & Van Vleck, Architects.
The A. Bentley & Sons Co., Contractors, Toledo, Ohio.

MONASTERY OF THE VISITATION, Toledo, Ohio.
J. C. Huber, Jr., Architect.
Julius Comti, Contractor.

ITALIAN CLUB BUILDING, Tampa, Fla.
Bonfoey & Elliott, Architects.

LIBERTY THEATRE, Youngstown, Ohio.
Frank Crane, Architect.
Frank Farrington, Contractor.

ST. BARTHOLOMEW'S CHURCH, New York City.
Bertram G. Goodhue, Architect.
Marc Eidlitz & Son, Contractors.

JEFFERSON JUNIOR HIGH SCHOOL, Rochester, N. Y.
Gordon & Madden, Architects.
Gorsline & Swan, Contractors.

COMMERCIAL HIGH SCHOOL, Atlanta, Ga.
Walker & Chase, Architects.
Wells Bros., Contractors.

STATE INSANE ASYLUM, Norman, Oklahoma.

ST. JOHNS HOSPITAL, Lowell, Mass.

COMMERCIAL HIGH SCHOOL, New Haven, Conn.

KALLURAH TEMPLE, Binghamton, N. Y.
Jones & Beers, Architects.
T. I. Lacey & Son, Contractors.

LINCOLN HIGH SCHOOL, Syracuse, N. Y.

MASONIC TEMPLE, Omaha, Neb.
Geo. Prinz, Architect.
Walter Peterson, Contractor.

GARAGE BUILDING, Des Moines, Iowa.
Leibbe, Norse, & Rassmusson, Architects.
Julian Geneva, Contractor.

These are but a few of the many buildings in which GF Steel-Tile floors have been used.

Length and Number of GF Steel-Tile Required for Various Spans

Clear Span	30″ Tile Number Requir'd	35″ Tile Number Requir'd	Total Length of Tile	End Caps Number Requir'd	Clear Span	30″ Tile Number Requir'd	35″ Tile Number Requir'd	Total Length of Tile	End Caps Number Requir'd	Clear Span	30″ Tile Number Requir'd	35″ Tile Number Requir'd	Total Length of Tile	End Caps Number Requir'd
8′ 0″	1	2	8′ 4″	2	18′ 9″	2	5	19′ 7″	2	29′ 6″	3	8	30′ 10″	2
8′ 3″	0	3	8′ 9″	2	19′ 0″	8	0	20′ 0″	2	29′ 9″	2	9	31′ 3″	2
8′ 6″	0	3	8′ 9″	2	19′ 3″	1	6	20′ 0″	2	30′ 0″	2	9	31′ 3″	2
8′ 9″	4	0	10′ 0″	2	19′ 6″	0	7	20′ 5″	2	30′ 3″	1	10	31′ 8″	2
9′ 0″	4	0	10′ 0″	2	19′ 9″	0	7	20′ 5″	2	30′ 6″	1	10	31′ 8″	2
9′ 3″	4	0	10′ 0″	2	20′ 0″	6	2	20′ 10″	2	30′ 9″	0	11	32′ 1″	2
9′ 6″	4	0	10′ 0″	2	20′ 3″	5	3	21′ 3″	2	31′ 0″	6	6	32′ 6″	2
9′ 9″	3	1	10′ 5″	2	20′ 6″	4	4	21′ 8″	2	31′ 3″	6	6	32′ 6″	2
10′ 0″	3	1	10′ 5″	2	20′ 9″	4	4	21′ 8″	2	31′ 6″	5	7	32′ 11″	2
10′ 3″	2	2	10′ 10″	2	21′ 0″	3	5	22′ 1″	2	31′ 9″	4	8	33′ 4″	2
10′ 6″	2	2	10′ 10″	2	21′ 3″	3	5	22′ 1″	2	32′ 0″	4	8	33′ 4″	2
10′ 9″	1	3	11′ 3″	2	21′ 6″	9	0	22′ 6″	2	32′ 3″	3	9	33′ 9″	2
11′ 0″	0	4	11′ 8″	2	21′ 9″	1	7	22′ 11″	2	32′ 6″	3	9	33′ 9″	2
11′ 3″	0	4	11′ 8″	2	22′ 0″	1	7	22′ 11″	2	32′ 9″	2	10	34′ 2″	2
11′ 6″	5	0	12′ 6″	2	22′ 3″	0	8	23′ 4″	2	33′ 0″	1	11	34′ 7″	2
11′ 9″	5	0	12′ 6″	2	22′ 6″	0	8	23′ 4″	2	33′ 3″	1	11	34′ 7″	2
12′ 0″	5	0	12′ 6″	2	22′ 9″	6	3	23′ 9″	2	33′ 6″	0	12	35′ 0″	2
12′ 3″	4	1	12′ 11″	2	23′ 0″	5	4	24′ 2″	2	33′ 9″	0	12	35′ 0″	2
12′ 6″	4	1	12′ 11″	2	23′ 3″	5	4	24′ 2″	2	34′ 0″	6	7	35′ 5″	2
12′ 9″	3	2	13′ 4″	2	23′ 6″	4	5	24′ 7″	2	34′ 3″	5	8	35′ 10″	2
13′ 0″	2	3	13′ 9″	2	23′ 9″	3	6	25′ 0″	2	34′ 6″	4	9	36′ 3″	2
13′ 3″	2	3	13′ 9″	2	24′ 0″	3	6	25′ 0″	2	34′ 9″	4	9	36′ 3″	2
13′ 6″	1	4	14′ 2″	2	24′ 3″	2	7	25′ 5″	2	35′ 0″	3	10	36′ 8″	2
13′ 9″	1	4	14′ 2″	2	24′ 6″	2	7	25′ 5″	2	35′ 3″	3	10	36′ 8″	2
14′ 0″	0	5	14′ 7″	2	24′ 9″	1	8	25′ 10″	8	35′ 6″	2	11	37′ 1″	2
14′ 3″	6	0	15′ 0″	2	25′ 0″	0	9	26′ 3″	2	35′ 9″	1	12	37′ 6″	2
14′ 6″	5	1	15′ 5″	2	25′ 3″	0	9	26′ 3″	2	36′ 0″	1	12	37′ 6″	2
14′ 9″	5	1	15′ 5″	2	25′ 6″	6	4	26′ 8″	2	36′ 3″	0	13	37′ 11″	2
15′ 0″	4	2	15′ 10″	2	25′ 9″	5	5	27′ 1″	2	36′ 6″	0	13	37′ 11″	2
15′ 3″	4	2	15′ 10″	2	26′ 0″	5	5	27′ 1″	2	36′ 9″	6	8	38′ 4″	2
15′ 6″	3	3	16′ 3″	2	26′ 3″	4	6	27′ 6″	2	37′ 0″	5	9	38′ 9″	2
15′ 9″	2	4	16′ 8″	2	26′ 6″	4	6	27′ 6″	2	37′ 3″	5	9	38′ 9″	2
16′ 0″	2	4	16′ 8″	2	26′ 9″	3	7	27′ 11″	2	37′ 6″	4	10	39′ 2″	2.
16′ 3″	1	5	17′ 1″	2	27′ 0″	2	8	28′ 4″	2	37′ 9″	3	11	39′ 7″	2
16′ 6″	1	5	17′ 1″	2	27′ 3″	2	8	28′ 4″	2	38′ 0″	3	11	39′ 7″	2
16′ 9″	0	6	17′ 6″	2	27′ 6″	1	9	28′ 9″	2	38′ 3″	2	12	40′ 0″	2
17′ 0″	6	1	17′ 11″	2	27′ 9″	1	9	28′ 9″	2	38′ 6″	2	12	40′ 0″	2
17′ 3″	6	1	17′ 11″	2	28′ 0″	0	10	29′ 2″	2	38′ 9″	1	13	40′ 5″	2
17′ 6″	5	2	18′ 4″	2	28′ 3″	6	5	29′ 7″	2	39′ 0″	0	14	40′ 10″	2
17′ 9″	4	3	18′ 9″	2	28′ 6″	5	6	30′ 0″	2	39′ 3″	0	14	40′ 10″	2
18′ 0″	4	3	18′ 9″	2	28′ 9″	5	6	30′ 0″	2	39′ 6″	6	9	41′ 3″	2
18′ 3″	3	4	19′ 2″	2	29′ 0″	4	7	30′ 5″	2	39′ 9″	5	10	41′ 8″	2
18′ 6″	3	4	19′ 2″	2	29′ 3″	4	7	30′ 5″	2	40′ 0″	5	10	41′ 8″	2

Properties of Steel-Tile Floors

2" of Concrete over Steel-Tile								
Width of Joists in In.	C. to C. of Joists in In.	Size Steel-Tile....	4"	6"	8"	10"	12"	14"
4"	24"	Average weight per square foot..	34.7	40.1	46.0	53.5	61.0	72.6
		Cu. ft. of concrete per sq. ft. of floor	.241	.278	.319	.371	.423	.505
		Core area % of Section.........	51.8	58.3	61.7	63.0	63.8	62.2
5"	25"	Average weight per square foot..	36.1	42.3	49.4	57.1	65.3	78.4
		Cu. ft. of concrete per sq. ft. of floor	.251	.293	.342	.396	.452	.537
		Core area % of section.........	49.8	55.9	59.2	60.3	61.2	59.7

2½" of Concrete over Steel-Tile									3"
Width of Joists in In.	C. to C. of Joists in In.	Size Steel-Tile....	4"	6"	8"	10"	12"	14"	14"
4"	24"	Average weight per square foot..	40.7	46.1	52.0	59.5	67.0	78.6	84.6
		Cu. ft. of concrete per sq. ft. of floor	.283	.32	.361	.413	.465	.546	.588
		Core area % of section.........	47.9	54.9	58.6	60.4	61.5	60.3	58.5
5"	25"	Average weight per square foot..	42.2	48.3	55.1	63.2	71.4	83.3	89.5
		Cu. ft. of concrete per sq. ft. of floor	.293	.335	.382	.438	.495	.579	.622
		Core area % of section.........	46.0	52.6	56.3	58.0	59.2	57.9	56.2

Steel-Tile Economically Shipped

The tables of weight below show conclusively the economy in shipping Steel-Tile as well as handling it on the job.

Both the Steel-Tile and the End-Tile nest snugly, taking up the minimum space, and stacks are of such shape that they are easily handled.

Width of Steel-Tile at bottom, exclusive of flange, 20".

STEEL-TILE				END-TILE	
Size	Approx. Weight Per 100 Pieces		Weight Per 100 Lineal Feet	Size	Approx. Weight Per 100 Pieces
	30" long	35" long			
4"	435	507	174	4"	63
6"	493	575	197	6"	83
8"	565	659	226	8"	100
10"	620	723	248	10"	118
12"	675	787	270	12"	128
14"	715	834	286	14"	140

Engineering Service

Write to our Engineering Service Department at any time for information regarding our materials. The opportunity to co-operate with designing architects and engineers will be thoroughly appreciated. Expert advice or estimates and specifications will be cheerfully furnished without obligation, for their consideration and approval.

General Theory and Working Formulas for Reinforced Concrete

THIS article is not intended as an elementary treatise on Reinforced Concrete, but rather to show the application of the general theory and formulas on which the foregoing tables are based. It is assumed that those who use this Handbook understand the general principles underlying Reinforced Concrete design.

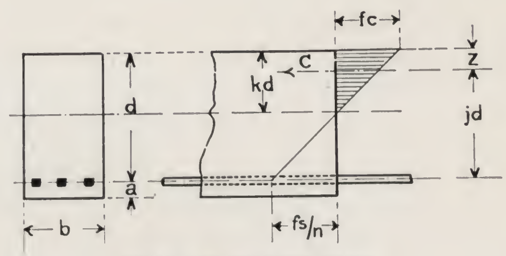
The accompanying formulas and computations are based on the following assumptions:

1. The adhesion between the concrete and steel is sufficient to make the two materials act together.
2. The Stress Strain curve for concrete in compression is a straight line.
3. The concrete carries no direct tension.
4. The ratio of the Modulus of Elasticity of Steel to that of 1:2:4 Concrete is 15.

The sketches illustrate graphically the principles embodied in the above assumptions.

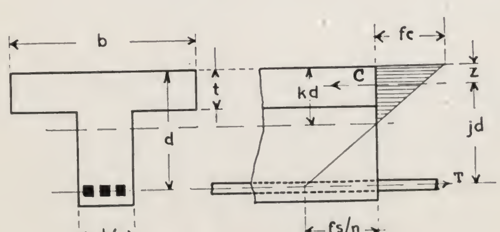
The following notations have been used throughout this Handbook:

Beams and Slabs



Stress in Rectangular Beam

f_s = the unit fiber stress of the steel.
f_c = the unit fiber stress of the concrete.
E_s = the modulus of elasticity of the steel.
E_c = the modulus of elasticity of the concrete in compression.
n = the ratio of $E_s \div E_c$.
T = the total tension in the steel at a section of the beam or slab.
C = the total compression on the concrete at a section of the beam or slab.
M = the bending moment in inch-pounds.
M_s = the moment of resistance of the steel in inch-pounds.
M_c = the moment of resistance of concrete in inch-pounds.
b = in inches the breadth of a rectangular beam or slab under consideration, or the width of flange of a T beam.



Stress in T-Beam

b′ = the width of stem of a T beam in inches.
d = the distance from the top of the compressive face of the concrete to the center of gravity of the steel.
k = the ratio of depth of the neutral axis to the effective depth d.
= the ratio of lever arm of resisting couple to depth d.
A_s = the cross-sectional area of steel.

p = the percentage of steel — equal to $\frac{A_s}{bd}$
z = the distance from top of concrete to the centroid of compression area.
jd = the arm of the resisting couple in inches; = d-z.

Shear

V = Total Vertical Shear at given section.

v = $\frac{V}{bjd}$ = unit Vertical Shear at given section in lbs. per sq. in.

v′ = v-60 = Shear in lbs. per sq. in. carried by Stirrups.

A_v = Sect. Area of one Stirrup Rod in sq. in.

S = Horizontal Spacing in inches of Stirrups at given section.

Bending Moments

Slabs and girders continuous over supports act as continuous beams and must be provided with reinforcing at these points to take care of the negative bending moment. Provision for the negative bending moment over the supports materially reduces the positive bending moment at the center of span. It is considered good practice to use the following values:

Freely supported at both ends . . . . M = 1/8 Wl

Freely supported at one end, and continuous at the other . . . . M = 1/10 Wl

Continuous over both supports . . . . M = 1/12 Wl

W = total load on the slab or beam under consideration.

l = span in feet if M is to be expressed in foot-pounds.

l = span in inches if M is to be expressed in inch-pounds.

Shear

Anything like a thorough analysis of shearing stresses would be far beyond the scope of this Handbook. Therefore, we will proceed on the assumption that the concrete is capable of resisting a unit shearing stress of 60 pounds per square inch, and that any shear in excess of this amount must be taken up by vertical stirrups.

Allowing a unit shearing stress in the steel of 12000 pounds per square inch, we have for the required horizontal spacing of the stirrups at any given section:

$$S = \frac{2A_v \times 12000}{bv} \qquad (1)$$

For beams uniformly loaded, stirrups should in general be spaced at "S" inches on centers for a distance from the support equal to about one-sixth of the span. From this point the spacing should be gradually increased for another one-sixth span. Stirrups spaced farther apart than a distance equal to jd cannot be considered effective, but may be employed as an aid in holding the main beam reinforcement.

Formulas

Rectangular Beams and Slabs

Location of neutral axis — $k = \sqrt{2pn + (pn)^2} - pn$ . . . . . . (2)

Arm of Resisting Couple — $j = 1 - \frac{1}{3}k$ . . . . . . (3)

Fibre Stresses . . . . $f_s = \frac{M}{A_s jd} = \frac{M}{pjbd^2}$ . . . . . . (4)

$$f_c = \frac{2M}{jkbd^2} = \frac{2pf_s}{k} \qquad (5)$$

Percentage of Steel— $p = \frac{A_s}{bd}$ . . . . . . (6)

For Balanced Reinforcement— $p = \frac{\frac{1}{2}}{\frac{f_s}{f_c}\left(\frac{f_s}{nf_c} + 1\right)}$ . . . . . . (7)

("Balanced Reinforcement" is the amount of steel reinforcement necessary to cause the beam or slab to be of equal strength in tension and compression at the allowable unit stresses.)

Depth "d" $d = \sqrt{\frac{M}{Rb}}$ in which $R = f_s pj$ . . . . . . (8)

For 12″ width of slab or rectangular beam, assuming $f_s = 16000$ and $f_c = 650$,

$$d = .028\sqrt{M} \qquad (9)$$

Steel required $A_s = \frac{M}{jdf_s} = pbd$ . . . . . . (10)

Formulas for T Beams

If the Neutral Axis falls in the Flange, use the foregoing formulas for Rectangular Beams; if in the Stem, the following will apply:

Location of Neutral Axis— $kd = \dfrac{2ndA_s + bt^2}{2nA_s + 2bt}$ . . . . (11)

Location of Resultant Compression—$z = \dfrac{t(3kd - 2t)}{3(2kd - t)}$ . . . . (12)

Arm of Resisting Couple— $jd = d - z$ . . . . (13)

Fiber Stresses— $f_c = \dfrac{Mkd}{bt\,(kd - \frac{1}{2}t)\,jd}$ . . . . (14)

$f_s = \dfrac{M}{A_s jd}$ . . . . (15)

Approximate formula— $T = \dfrac{M}{d - \frac{1}{2}t}$ . . . . (16)

Stayed Columns

Notation

P = safe load or total vertical load.

f_c = allowable unit stress for concrete in direct compression.

A_c = total cross sectional area of concrete in compression.

n = E_s/E_c = 15.

A_s = total cross sectional area of vertical steel.

$P = f_c\,[A_c + nA_s]$ . . . . (17)

Hooped Columns

With Longitudinal Reinforcement

(Joint Committee Recommendations)

Columns to be reinforced with not less than 1% and not more than 4% of longitudinal bars and with circular hoops or spirals not less than 1% of the volume of the concrete. A unit stress of 34.9% of the ultimate compressive strength of concrete may be used provided the ratio of unsupported length of column to diameter of the hooped core is not more than 10.

It is recommended that the minimum size of columns to which the working stresses may be applied be 12 inches out to out.

The clear spacing of hooping shall not be greater than one-sixth the diameter of the enclosed column and preferably not greater than one-tenth and in no cases more than 2½ inches.

P = total strength of the reinforced column for the given stress.

E_s = the modulus of elasticity of the steel.

E_c = the modulus of elasticity of the concrete in compression.

N = ratio of $E_s \div E_c$

A = total net area of column.

f_c = compressive unit stress in conc.

p = Steel ratio $A_s \div A$

A_s = Area of longitudinal steel.

$P = f_c A\,[1 + (n - 1)\,p]$ or $A = \dfrac{P}{f_c\,[1 + (n - 1)\,p]}$

Computation of GF Steel-Tile Slab Using Formulas

Span 20′-0″ L. L. 80 lbs. $f_s = 16000$ $f_c = 650$ $n = 15$.

Assume 12″ GF Steel-Tile and 2″ Conc. Slab. Joists 25″ on centers. (5″ wide at bottom.)

d = 12½″.

Load on 1 Joist:

Live Load—	80 lbs. per Sq. Ft.
Slab and Joist—	65 lbs. per Sq. Ft.
Flr. Finish—	12 lbs. per Sq. Ft.
Ceiling—	8 lbs. per Sq. Ft.
	165 lbs. per Sq. Ft. × 2.08 = 343 lbs. per Lin. Ft. of Joist.

Total Load on 1 Joist = 343 x 20 = 6860 lbs.

$$M = \frac{6860 \times 20 \times 12}{10} = 164700 \text{ inch lbs.}$$

From Formula (10) $A_s = \frac{164700}{11.5 \times 16000} = .895$ Sq. Inches.

(In which 11½″ is Approx. Lever Arm = d—½t)

From Formula (11) We have $kd = \frac{2 \times 15 \times 12.5 \times .895 + 25 \times 4}{2 \times 15 \times .895 + 2 \times 25 \times 2} = 3.434''$.

As Kd is Greater Than 2″, The Neutral Axis is in the Web, and T Beam Formula Applies.

From Formula (12) $z = \frac{2\,(3 \times 3.434 - 4)}{3\,(2 \times 3.434 - 2)} = .863$.

From Formula (13) $jd = 12.50 - .863 = 11.63$.

Actual Steel Req'd—Formula (10) $A_s = \frac{164700}{11.637 \times 16000} = .88$ Sq. Inches.

Use 2—¾″ Round Bars = .88 Sq. Inches.

From Formula (14) $f_c = \frac{164700 \times 3.434}{25 \times 2\ (3.434 - \frac{1}{2}t)\ 11.637} = 400$ lbs. Per Sq. In. Which is Well Below the 650 lbs. Allowed.

Maximum End Shear = ½ Total Load on Joist = 3430 Lbs.

Unit Shear $= \frac{3430}{93.85} = 36.5$ Lbs. per Sq. Inch.

Table of Weights of Materials and Loads in Storage Warehouses

MATERIAL	Weights per cu. ft. of space Pounds	Weights per sq. ft. of floor Pounds	Recommended live loads in pounds per sq. ft.
GROCERIES, WINES, LIQUORS, ETC.			
Beans in bags	40	320	250 to 300
Canned goods in cases	58	348	250 to 300
Coffee in bags	39	312	250 to 300
Flour	40	200	250 to 300
Molasses	48	240	250 to 300
Rice	58	348	250 to 300
Salt in bags	70	350	250 to 300
Sugar in barrels	43	215	250 to 300
Tea in chests	25	200	250 to 300
Wines and liquors in barrels	38	228	250 to 300
DRY GOODS — COTTON, WOOL, ETC.			
Burlap in bales	43	258	200 to 250
Cotton in bales, compressed	18	144	200 to 250
Cotton goods in cases	28	224	200 to 250
Hemp, manila	30	240	200 to 250
Jute	41	328	200 to 250
Linen goods	30	240	200 to 250
Wool in bales, not compressed	13	104	200 to 250
Wool in bales, compressed	48	104	200 to 250
Woolen goods in cases	27	216	200 to 250
BUILDING MATERIALS, HARDWARE, ETC.			
Portland Cement	73	438	300 to 400
Small Hardware	30 to 65	300 to 400	300 to 400
Sheet Tin in boxes	278	556	300 to 400
Wire coils	75	450	300 to 400
DRUGS, PAINTS, OILS, ETC.			
Alum in barrels	33	198	200 to 300
Glycerine in cases	52	312	200 to 300
Linseed oil in drums	45	180	200 to 300
Rosin in barrels	48	288	200 to 300
Soda, caustic, in iron drums	88	294	200 to 300
Sulphuric acid	60	100	200 to 300
White lead in cans	174	610	200 to 300
White lead, dry	86	408	200 to 300
Red lead and Litharge	132	495	200 to 300
MISCELLANEOUS			
Glass and chinaware in crates	40	320	300
Hides and leather	20	160	300
Paper, newspaper and straw board	35	210	300
Paper, writing	60	360	300
Rope in coils	32	192	300

NOTE — The figures in the column under weights per sq. ft. of floor are based on the height to which it is convenient and practical to pile the different kinds of material, viz.: Beans in bags can be piled to 8′, salt to 5′, cement to 6′, etc.

Cubic Yards Concrete Required for Beams, Columns and Slabs

CUBIC YARDS OF CONCRETE FOR BEAMS 100 FT. LONG										COLUMNS					SLABS		
											Square		Round				
Width / DEPTH	4 Inch	5 Inch	6 Inch	7 Inch	8 Inch	9 Inch	10 Inch	11 Inch	12 Inch	Side of Square or Diam. of Round	Cubic Yds. per Ft. Height	Weight per Ft. Height and Area Section	Cubic Yds. per Ft. Height	Weight per Ft. Height and Area Section	Thickness	Cubic Yds. Per 100 Sq. Ft.	Weight Per Sq. Ft.
4″	.412																
5″	.515	.643															
6″	.617	.772	.926							6″	.009	36					
7″	.720	.900	1.080	1.260						7″	.013	49			2″	.6175	24
8″	.823	1.029	1.235	1.440	1.646					8″	.016	64			2½″	.7715	30
9″	.926	1.157	1.389	1.620	1.852	2.083				9″	.021	81			3″	.926	36
10″	1.029	1.286	1.543	1.801	2.058	2.315	2.572			10″	.026	100					
11″	1.132	1.415	1.697	1.981	2.263	2.546	2.829	3.112		11″	.031	121			3½″	1.080	42
12″	1.235	1.543	1.852	2.161	2.469	2.778	3.086	3.395	3.704	12″	.037	144	.029	113.1			
13″	1.337	1.672	2.006	2.340	2.675	3.009	3.343	3.677	4.012	13″	.043	169	.034	132.7	4″	1.235	48
14″	1.440	1.801	2.161	2.521	2.881	3.241	3.601	3.961	4.321	14″	.050	196	.040	153.9			
15″	1.543	1.929	2.315	2.701	3.086	3.472	3.858	4.244	4.630	15″	.058	225	.045	176.7	4½″	1.389	54
16″	1.646	2.058	2.468	2.881	3.292	3.704	4.115	4.526	4.936	16″	.066	256	.052	201.1			
17″	1.749	2.186	2.624	3.061	3.498	3.935	4.373	4.810	5.247	17″	.074	289	.058	227.0	5″	1.543	60
18″	1.852	2.315	2.778	3.241	3.704	4.167	4.630	5.093	5.555	18″	.083	324	.065	254.5			
19″	1.955	2.443	2.932	3.421	3.909	4.398	4.887	5.376	5.864	19″	.093	361	.073	283.5	5½″	1.698	66
20″	2.058	2.572	3.086	3.601	4.115	4.630	5.144	5.658	6.173	20″	.103	400	.081	314.2			
21″	2.161	2.701	3.240	3.781	4.321	4.861	5.402	5.941	6.482	21″	.113	441	.089	346.4	6″	1.852	72
22″	2.263	2.829	3.394	3.961	4.526	5.093	5.659	6.224	6.790	22″	.124	484	.098	380.1			
23″	2.366	2.958	3.549	4.141	4.732	5.324	5.916	6.507	7.099	23″	.136	529	.107	415.5	6½″	2.006	78
24″	2.469	3.086	3.704	4.321	4.938	5.555	6.173	6.790	7.408	24″	.148	576	.116	452.4			
25″	2.572	3.215	3.858	4.501	5.143	5.786	6.429	7.072	7.716	25″	.160	625	.126	490.9	7″	2.161	84
26″	2.674	3.343	4.012	4.680	5.349	6.018	6.686	7.358	8.023	26″	.174	676	.136	530.9			
27″	2.778	3.472	4.167	4.861	5.556	6.249	6.944	7.638	8.333	27″	.187	729	.147	572.6	7½″	2.315	90
28″	2.881	3.601	4.321	5.041	5.761	6.481	7.202	7.922	8.642	28″	.201	784	.158	615.8	8″	2.469	96
29″	2.984	3.729	4.475	5.221	5.967	6.713	7.459	8.205	8.951	29″	.216	841	.170	660.5	8½″	2.624	102
30″	3.086	3.858	4.630	5.401	6.173	6.944	7.716	8.488	9.259	30″	.231	900	.182	706.9	9″	2.778	108
31″	3.189	3.987	4.784	5.581	6.379	7.176	7.974	8.770	9.568	31″	.247	961	.194	754.8	9½″	2.932	114
32″	3.292	4.115	4.938	5.761	6.584	7.407	8.230	9.053	9.876	32″	.263	1024	.207	804.2	10″	3.086	120
33″	3.395	4.244	5.091	5.941	6.790	7.639	8.487	9.336	10.18	33″	.280	1089	.220	855.3	10½″	3.241	126
34″	3.498	4.372	5.248	6.122	6.996	7.870	8.745	9.619	10.49	34″	.292	1156	.233	907.9	11″	3.396	132
35″	3.601	4.501	5.401	6.301	7.201	8.101	9.002	9.902	10.80	35″	.315	1225	.247	962.1	11½″	3.550	138
36″	3.704	4.630	5.555	6.481	7.407	8.333	9.259	10.19	11.11	36″	.333	1296	.262	1017.9	12″	3.704	144

Weight and Area of Square and Round Bars

Size Inches	Weight in Lbs. per foot		Area in square inches		Size Inches	Weight in Lbs. per foot		Area in square inches	
	□	○	□	○		□	○	□	○
¼″	.213	.167	.0625	.0491	$\frac{11}{16}$″	1.607	1.262	.4727	.3712
$\frac{5}{16}$″	.332	.261	.0977	.0767	¾″	1.913	1.502	.5625	.4418
⅜″	.478	.376	.1406	.1105	$\frac{13}{16}$″	2.245	1.763	.6602	.5185
$\frac{7}{16}$″	.651	.511	.1914	.1503	⅞″	2.603	2.044	.7656	.6013
½″	.850	.668	.2500	.1963	$\frac{15}{16}$″	2.988	2.347	.8789	.6903
$\frac{9}{16}$″	1.076	.845	.3164	.2485	1″	3.400	2.670	1.0000	.7854
⅝″	1.328	1.043	.3906	.3068					

Quantities of Materials for One Cubic Yard of Rammed Concrete Based on a Barrel of 3.8 Cubic Feet

(Reprinted by permission from Taylor & Thompson's "Concrete, Plain and Reinforced," page 231)

Proportions by Parts			Proportions by Volumes			Volume of Mortar in Terms of Percentage of Volume of Stone	Percentages of Voids in Broken Stone or Gravel														
							50%*			45%†			40%‡			30%§			20%§		
Cement	Sand	Stone	Packed Cement	Loose Sand	Loose Stone		Cement	Sand	Stone	Cement	Sand	Stone	Cement	Sand	Stone	Cement	Sand	Stone	Cement	Sand	Stone
			bbl.	cu. ft.	cu. ft.		bbl.	cu. yd.	cu. yd.	bbl.	cu. yd.	cu. yd.	bbl.	cu. yd.	cu. yd.	bbl.	cu. yd.	cu. yd.	bbl.	cu. yd.	cu. yd.
1	1	1½	1	3.8	5.7	99	3.19	0.45	0.67	3.08	0.43	0.65	2.97	0.42	0.63	2.78	0.39	0.59	2.62	0.37	0.55
1	1	2	1	3.8	7 6	75	2.85	0.40	0.80	2.73	0.38	0.77	2.62	0.37	0.74	2 43	0.34	0.68	2.26	0.32	0.64
1	1	2½	1	3.8	9.5	61	2.57	0.36	0.90	2.45	0.34	0.86	2.34	0.33	0.82	2.15	0.30	0.76	1.99	0.28	0.70
1	1	3	1	3.8	11.4	51	2.34	0.33	0.99	2.22	0.31	0.94	2.12	0.30	0.90	1.93	0.27	0.82	1.77	0.25	0.75
1	1½	2	1	5.7	7.6	93	2.49	0.53	0.70	2.40	0.51	0.68	2.31	0.49	0.65	2.16	0.46	0.61	2.03	0.43	0.57
1	1½	2½	1	5.7	9.5	76	2.27	0.48	0.80	2.18	0.46	0.77	2.09	0.44	0.74	1.94	0.41	0.68	1.80	0.38	0.63
1	1½	3	1	5.7	11.4	64	2.09	0.44	0.88	2.00	0.42	0.84	1.91	0.40	0.81	1.76	0.37	0.74	1.63	0.34	0.69
1	1½	3½	1	5.7	13.3	55	1.94	0.41	0.96	1.84	0.39	0.91	1.76	0.37	0.87	1.61	0.34	0.79	1.48	0.31	0.73
1	1½	4	1	5.7	15.2	49	1.80	0.38	1.01	1.71	0.36	0.96	1.63	0.34	0.92	1.48	0.31	0.83	1.36	0.29	0.77
1	1½	4½	1	5.7	17.1	44	1.69	0.36	1.07	1.60	0.34	1.01	1.51	0.32	0.96	1.37	0.29	0.87	1.25	0.26	0.79
1	1½	5	1	5.7	19.0	40	1.59	0.34	1.12	1.50	0.32	1.06	1.42	0.30	1.00	1.28	0.27	0.90	1.17	0.25	0.82
1	2	3	1	7.6	11.4	75	1.89	0.53	0.80	1.81	0.51	0.76	1.74	0.49	0.74	1.61	0.45	0.68	1.50	0.42	0.63
1	2	3½	1	7.6	13.3	65	1.76	0.49	0.87	1.68	0.47	0.83	1.61	0.45	0.79	1.48	0.42	0.73	1.38	0.39	0.68
1	2	4	1	7.6	15.2	57	1.65	0.46	0.93	1.57	0.44	0.88	1.50	0.42	0.84	1.38	0.39	0.78	1.27	0.36	0.72
1	2	4½	1	7.6	17.1	51	1.55	0.44	0.98	1.48	0.42	0.94	1.41	0.40	0.89	1.28	0.36	0.81	1.18	0.33	0.75
1	2	5	1	7.6	19.0	47	1.47	0.41	1.03	1.39	0.39	0.98	1.32	0.37	0.93	1.20	0.34	0.84	1.10	0.31	0.77
1	2	5½	1	7.6	20.9	43	1.39	0.39	1.08	1.31	0.37	1.01	1.25	0.35	0.97	1.13	0.32	0.87	1.03	0.29	0.80
1	2	6	1	7.6	22.8	40	1.32	0.37	1.11	1.25	0.35	1.06	1.18	0.33	1.00	1.06	0.30	0.89	0.97	0.27	0.82
1	2½	3	1	9.5	11.4	87	1.72	0.61	0.73	1.66	0.58	0.70	1.60	0.56	0.68	1.49	0.52	0.63	1.40	0.49	0.59
1	2½	3½	1	9.5	13.3	75	1.62	0.57	0.80	1.55	0.55	0.76	1.49	0.52	0.73	1.38	0.49	0.68	1.29	0.45	0.64
1	2½	4	1	9.5	15.2	66	1.52	0.54	0.86	1.46	0.51	0.82	1.40	0.49	0.79	1.29	0.45	0.73	1.19	0.42	0.67
1	2½	4½	1	9.5	17.1	60	1.44	0.51	0.91	1.37	0.48	0.87	1.31	0.46	0.83	1.20	0.42	0.76	1.11	0.39	0.70
1	2½	5	1	9.5	19.0	54	1.37	0.48	0.96	1.30	0.46	0.92	1.24	0.44	0.87	1.13	0.40	0.80	1.04	0.37	0.73
1	2½	5½	1	9.5	20.9	49	1.30	0.46	1.01	1.23	0.43	0.95	1.17	0.41	0.91	1.07	0.38	0.83	0.98	0.34	0.76
1	2½	6	1	9.5	22.8	46	1.24	0.44	1.05	1.17	0.41	0.99	1.11	0.39	0.94	1.01	0.36	0.85	0.92	0.32	0.78
1	2½	6½	1	9.5	24.7	42	1.18	0.42	1.08	1.12	0.39	1.02	1.06	0.37	0.97	0.96	0.34	0.88	0.88	0.31	0.80
1	2½	7	1	9.5	26.6	40	1.13	0.40	1.11	1.07	0.38	1.05	1.01	0.36	0.99	0.91	0.32	0.90	0.83	0.29	0.82
1	3	4	1	11.4	15.2	76	1.42	0.60	0.80	1.36	0.57	0.77	1.30	0.55	0.73	1.21	0.51	0.68	1.12	0.47	0.63
1	3	4½	1	11.4	17.1	68	1.34	0.57	0.85	1.28	0.54	0.81	1.23	0.52	0.78	1.13	0.48	0.72	1.05	0.44	0.66
1	3	5	1	11.4	19.0	61	1.28	0.54	0.90	1.22	0.52	0.86	1.17	0.49	0.82	1.07	0.45	0.75	0.99	0.42	0.70
1	3	5½	1	11.4	20.9	56	1.22	0.52	0.94	1.16	0.49	0.90	1.11	0.47	0.86	1.01	0.43	0.78	0.93	0.39	0.72
1	3	6	1	11.4	22.8	52	1.16	0.49	0.98	1.11	0.47	0.94	1.05	0 44	0.89	0.96	0.41	0.81	0.88	0.37	0.74
1	3	6½	1	11.4	24.7	48	1.12	0.47	1.02	1.06	0.45	0.97	1.01	0.43	0.92	0.92	0.39	0.84	0.84	0.35	0.77

NOTE—Variations in the fineness of the sand and the compacting of the concrete may affect the quantities 10 per cent in either direction.

*Use 50 per cent columns for broken stone screened to uniform size. †Use 45 per cent columns for average conditions and for broken stone with dust screened out. ‡Use 40 per cent columns for gravel or mixed stone and gravel. §Use these columns for scientifically graded mixtures.

GF PEDS

PEDS are "spot grounds" for attaching wood and metal trim to walls, and floor screeds to concrete floors. They supplant old-fashioned methods of grounding that are costly in time, labor, and material. Use of PEDS on any job will result in such a marked saving in skilled labor, time, and money that no architect or contractor who tries PEDS will return to the old method of grounding.

Each PED consists of a round nailing block of wood securely clinched into a circular metal disk which has holes punched in it, through which plaster — by which it is applied — is forced. The completed plaster wall holds the PED firmly in place.

GF Floor Peds give a firm foundation for screeds, and are easily placed

PEDS are used on concrete floors to give a firm foundation and a positive anchor for the screeds or sleepers to which the floor is nailed. PEDS are also used for anchoring carpet strips in cement floors. In setting Floor PEDS, Portland cement mortar is used, and guide PEDS may be set 14 to 16 ft. apart to the desired level. When these PEDS are firm, a line may be stretched to mark the elevation of intermediate PEDS which may be quickly and accurately placed by forcing each PED into a bed of cement mortar to the level of the guide line.

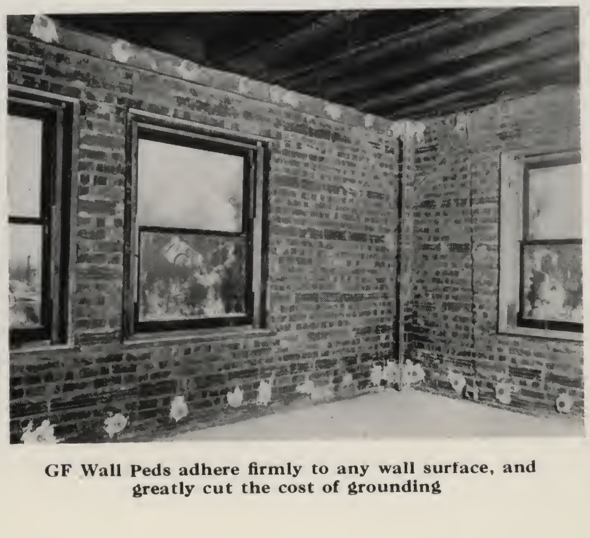
Floor Screeds are nailed directly to the PEDS after the mortar has set.

All leveling, wedging and bracing of Screeds is eliminated and a secure and accurate anchorage is obtained at a decided saving in cost.

PEDS for walls greatly simplify the placing of baseboards, chair rails, plate rails, and picture moulding. They also afford a firm foundation for plumbing fixtures, hand rails, electrical fixtures, and telephone boxes, and for attaching wallboard or plasterboard over masonry walls. Wall PEDS adhere tightly to any metal lath, brick concrete, gypsum block or hollow tile wall, and hold trim and fixtures solidly and securely.

In setting Wall PEDS, a dab of common hard wall plaster is spread over the back of the PED, and it is pressed against the wall until the plaster keys through the holes in the metal disk and the face of the PED is brought to proper alignment. PEDS are spotted in the corners of the room first, at the proper height from the floor. The intermediate PEDS are then lined up with these by means of a line or straight edge. Trim is nailed directly to the PEDS.

PEDS are packed in boxes. A box of Wall PEDS contains 900 half-inch PEDS and a package of 50 three-quarter inch PEDS and 50 quarter-inch PEDS to take care of inequalities in the wall. A box of Floor PEDS contains 900 three-quarter inch PEDS and 100 half-inch PEDS.

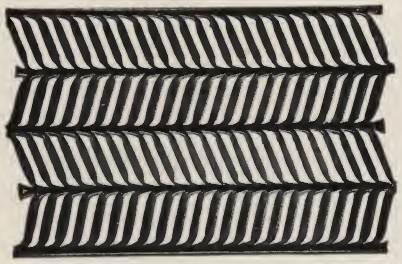


GF Wall Peds adhere firmly to any wall surface, and greatly cut the cost of grounding

Other GF Products

BESIDES Steel-Tile, we manufacture other fireproof building products such as are essential to the best concrete, stucco and plaster construction. Each product represents the evolution of years of scientific study and experimentation. Each stands for the three GF virtues — speed in erection, economy in cost and upkeep, and permanence.

Herringbone Rigid Metal Lath



Herringbone is the stiffest metal lath made. Its heavy longitudinal ribs, set at an angle of 45° to the plane of the lath, give strength and rigidity. Because of this, Herringbone permits of wider spacing of studs, is easy to erect (one man can handle it where two are required by the more flimsy types), saves plaster and will not buckle or sag between the studs, nor does it require stretching to insure a flat surface for the plaster.

Furnished painted or galvanized; also in rust-resisting Armco Iron painted.

Style BB

Sheets 20¼ x 96″.........1½ square yards

Packed 15 sheets (22½ square yards) per bundle.

Weight Per Square Yard

Gauge	Painted	Galvanized
No. 27	2.25 lbs.	2.82 lbs.
No. 26	2.50 lbs.	Not Made
No. 24	3.37 lbs.	3.91 lbs.

Style A

Sheets 13½ x 96″...........1 square yard

Packed 20 sheets (20 square yards) per bundle.

Weight Per Square Yard

Gauge	Painted	Galvanized
No. 28	3.00 lbs.	3.75 lbs.

Style AAA

Sheets 18 x 96″...........1⅓ square yards

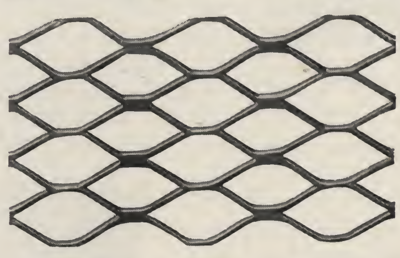
Packed 15 sheets (20 square yards) per bundle.

Weight Per Square Yard			Stud Spacing Center to Center	
Gauge	Painted	Galvanized	Walls	Ceilings
No. 27	2.53 lbs.	3.17 lbs.	16″ to 18″	16″
No. 26	2.81 lbs.	Not Made	20″	18″
No. 24	3.79 lbs.	4.39 lbs.	22″ to 24″	20″, 22″, 24″

GF Waterproofings and Dampproofings

GF No. 10 Integral Waterproofing Paste.
GF No. 11 Integral Waterproofing Powder.
GF No. 12 Cement Ascelerator.
GF No. 15 Trowel Coating.
GF No. 16 Foundation Brush Coating.
GF No. 17 Mop Coating.
GF No. 18 Waterproofing Felt.
GF No. 21 Saturated Fabric.
GF No. 99 Acidproofing.
GF No. 100 Colorless Waterproofing.
GF No. 101 Cement and Masonry Coating.
GF No. 101 Thinner.
GF No. 140 Concrete Hardener.
GF No. 140 Special Oilproofing.
GF No. 145 Floor Hardener.
GF No. 150 Floor Primer.
GF No. 155 Floor Enamel.
GF No. 200 Dampproofing Coating.
GF No. 220 Stainproof Stone Backing.
GF No. 250 Mastic Cement.
GF No. 250 Liquid Primer.
GF No. 300 Steel Coating.
GF No. 325 Protective Coating.
GF No. 350 Galvanized Iron Coating.
GF No. 400 Bonding Compound.
GF No. 550 Wood Preservative.

"Key" Expanded Metal Lath



"Key" Expanded Metal Lath is used for all classes of work — walls, partitions, ceilings and stucco. It is especially suited, however, for lathing domes, wrapping beams, and columns, and for ornamental plastering, as the mesh is uniformly pliable and readily lends itself to curved formations.

Consult Our Engineering Service Department

For information at any time — their advice will be complete and dependable and, if you wish, in the form of specifications for the work.

Self-Sentering

Self-Sentering is a combined reinforcing and centering — a one-piece metal lath and stud — a composite lath and furring — all these in one.

Self-Sentering is a series of heavy cold drawn ribs, 11/16″ high, always spaced 3⅝″ center to center, connected by the only efficient form of expanded metal reinforcement, the diamond mesh.

Self-Sentering is made in sheets 29 inches wide and in lengths of 4, 5, 6, 7, 8, 9, 10, 11 and 12 feet. Longer lengths up to 14 feet furnished on special orders.

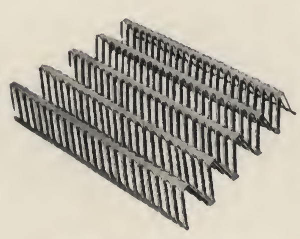
The following weights and gauges carried in stock for prompt shipment:

Gauge	Shipping Wt. Per Sq. Ft., Bundled, Painted Material	Shipping Wt. Per Sq. Ft., Bundled, Galvanized	Effective Sectional Area Per at. of Width
28	.58 lbs.	.73 lbs.	.173 sq. in.
26	.70 lbs.	.83 lbs.	.208 sq. in.
24	.93 lbs.	Not Made	.277 sq. in.

Galvanized Self-Sentering furnished on special order only.

Trussit

The Basis of a Solid Cement Wall Built without Studding



Trussit is unique in form

Trussit is a distinctive material. It was originated by The General Fireproofing Company and has been manufactured and sold by us for years. No other material approaches Trussit in appearance, form or the characteristics which make it an unrivaled base for plastered walls or partitions. Many of the country's foremost engineers specify and use Trussit in preference to other material for non-bearing partitions and curtain walls.

Specific literature on any of these products furnished on request.

Form A-487

THE CORDAY & GROSS COMPANY, CLEVELAND

D. E. Fryer & Company,

Lumber Exchange,

Seattle, Wash.